GEOGRAPHY
OF
NORTH AMERICA

BY

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PREFACE

THE central and dominant theme of modern geography is found in the adjustments that people make to their natural environment. Geography is a *cause* and *effect* study. Hence the distinctive purpose of a geographic study of North America is to ascertain how the people of that continent are influenced by their natural environment (1) in living where they do, (2) in the activities followed by them, (3) in the evolution of distinctive human characteristics, and (4) in their thinking upon social, political, and economic questions of local, national, or international import. This involves consideration of physical features such as climate, topography, soils, minerals, coast line, water, etc., and of the native plant and animal life as elements in the environment. The authors believe these features should receive sufficient consideration in a text to enable the student to determine to what extent they are causes of the human adjustments made. Some students have a tendency to forget the earth upon which man lives in their enthusiasm for describing what he does.

It seems that many traditions in the preparation of textbooks and in the field of education have been violated in recent years; and the authors find that, to accomplish their purpose, they have violated another, viz., uniformity of treatment. They have adapted their treatment to the subject matter and to their objectives, instead of forcing them into some preconceived uniform scheme. A text for teachers' colleges, junior colleges and universities should serve at least three major purposes. It should (1) provide information, (2) develop geographic reasoning and (3) present various plans of organizing geographic material as a foundation for study and critical analysis. Learning *how* to work effectively is more important than the mere acquisition of facts. The young student, early in his studies, should become familiar with numerous methods of attacking a problem, and organizing and presenting the material. The practice of *telling* students *about* various methods and avoiding actual use of any except the "topical outline" does not produce working ability among students. Experience has shown that best results are obtained by actually preparing the subject matter by various methods, such as the problem, topic, historical, human-use regions, etc., hence this plan has been followed, since this book is intended for use as a basal text and not as a treatise. The plan of organization, kinds of illustrations, and their legends, as well as the subject matter, should be subjects of analysis and criticism. Such procedure is especially important in the preparation of teachers, and little less so in the preparation of young people for the ordinary life work of an active cit-

izen. The well-trained teacher must have adequate knowledge (1) of the subject to be taught, (2) of boys and girls, (3) of plans of organizing subject matter, and (4) of the technique of presentation. The first and third, which properly belong to a geography text, can be presented best by organizing the subject matter by differing plans. The other two can be presented best by specialists in those fields, since they belong primarily to educational theory. The two elements stressed in this text—subject matter and organization—are equally important to the junior college student. Too often the technique of study and organization is left to the years of graduate study.

The usual statistical appendix has been omitted, since such material is readily obtainable from Government and other sources and any school can provide ample resources for study. Furthermore, students should receive training in the use of original source material. A suggestive list of references has been placed at the end of the book.

The authors wish to acknowledge their indebtedness to many individuals and Government bureaus whose work has been drawn upon freely in the preparation of this text. Without the splendid work of Dr. O. E. Baker and his colleagues, the discussion of agriculture in the United States would be inadequate indeed. Dr. Baker has also given freely of research work carried on outside of his official duties in the Department of Agriculture. The authors refer particularly to the maps reproduced by courtesy of Dr. Baker and *Economic Geography*. They desire to acknowledge the assistance given by many Government departments at Washington, especially the Departments of Agriculture and Commerce, the Geological Survey, and the Bureaus of Forestry and Fisheries. Specific acknowledgments are made throughout the text.

The authors are especially indebted to various departments of the Canadian Government and particularly to F. C. C. Lynch, Director of the Natural Resources Intelligence Service, who supplied a great amount of material, maps, diagrams, and photographs and read the entire manuscript on Canada and offered numerous helpful suggestions. They also owe much to hundreds of students who have used the text material in manuscript form during the past eight years. The text has passed through the test of actual classroom use and many revisions based on experience gained thereby. Further criticisms and suggestions are invited.

The Preface, Organizing Geographic Material, and chapters III, VIII–XII, XXI–XXVII were written primarily by Mr. Miller, and chapters I, II, IV–VII, XIII–XX, XXVIII–XXX by Mr. Parkins.

George J. Miller
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ORGANIZING GEOGRAPHIC MATERIAL

SUGGESTIONS TO STUDENTS AND TEACHERS

THE student who expects to do more than merely learn by rote is always confronted by the task of organizing the material gathered. How shall it be done? What is the best form? It is a perplexing question—a problem to which there is no one answer. Hence it is desirable to be familiar with a variety of plans. Then one may select the plan that best suits the subject matter and the objective to be accomplished. Experience makes it clear that there is no *one* way of organizing subject matter, no *one* type of outline, no *one* method of presentation that should be followed to the exclusion of all others. Some methods appear (in the worker's judgment) better for this, and some better for that. The teacher and the more experienced student are likely to succeed best with their own plans. *Plans come and go with great rapidity.* Each plan probably leaves a residuum contribution to educational method. Of course, he who possesses adequate knowledge of subject matter and equally adequate knowledge of educational methods is best equipped to succeed in organizing and presenting material. Such knowledge does not assure success, as there is no substitute for the personal human element. Methods can never be more than aids, and they must always be secondary to knowledge of subject matter. There are more failures due to inadequate knowledge of the subject than to faulty method.

REGIONAL AND POLITICAL UNITS

Regional Units.—In recent years many efforts have been made to divide the continents into various regions independent of political boundaries. These plans include physiographic regions, natural regions, geographic regions, and human-use regions. Many factors must be considered in delimiting a region, such as (1) surface and rock structure, (2) temperature—mean annual, seasonal, range, length of growing season, (3) rainfall—mean annual, seasonal amount, character and frequency of fall, monthly distribution, (4) principal types of soils, (5) principal minerals, (6) native vegetation, (7) agriculture—corn, wheat, cotton, etc., (8) manufacturing and manifold other human activities. Probably the most remarkable feature of the regional maps thus far produced

is their striking dissimilarity. This is due to the great difference in the importance assigned by the authors to the various elements that must be considered in delimiting a region. It appears to be necessary to stress some one or two features in order to delineate a region, and even then the boundaries are zonal rather than lineal. It thus follows that there are about as many types of regions as there are map makers, and the process becomes essentially a *method* of organizing that best suits the author. Such maps represent personal opinions—not geographic realities; and this should always be kept in mind in their use. Teaching and studying them as existing realities is a doubtful procedure. It appears far better to consider all environmental factors and human activities, with authoritative maps and data for each.

From the viewpoint of human ecology the geographic and human-use regions are probably preferable. They are effective in presenting certain unities in a general way, especially when it is desired to emphasize some specialized activity, e.g., the Spring Wheat Region, the Corn Belt, etc. However, even a region like the Corn Belt is characterized by diversity of human interests rather than by homogeneity. It is a good agricultural classification with corn as the leading crop, but the Corn Belt also produces about a fifth of the product-value of the manufactures of the country. A geographic region may have a number of human activities, and the over-stressing of one is misleading. However, this can be avoided readily.

Political Units.—Political units have long been the more generally used method of organizing material. The method is weak in that political boundaries do not agree with natural features and the same human activities are frequently followed on both sides of an artificial line. It is strong because most human-activity data are available on the basis of political units and because *nations*—France, Switzerland, Denmark, Norway, Great Britain, etc.,—are the units with which people are primarily concerned. In this respect natural regions, geographic regions, etc., are academic rather than practical. Political units are just as truly geographic as are physical or human-use units. Holland, Belgium, and Germany are just as much geographical units as is the North European Plain upon which they are located. It is unlikely that any physical boundary "has anything like the significance of the political boundary between the United States and Mexico."[1] However, the strong features of geographic and human-use regions may be combined readily with those of the political, and both student and teacher will find such a plan desirable in many cases.

[1] R. H. Whitbeck, Fact and Fiction in Geography by Natural Regions. Jour. of Geog., Vol. 22, p. 92.

of project, and it may be necessary to solve many problems in carrying out a major project. It may be the purpose of the worker to prepare an exhibit or write a magazine article that will typify Illinois—a project. Shall agriculture, manufacturing, mining, or commerce be the central and dominant theme?—a problem.

TYPE STUDY AND TOPICAL OUTLINE

The Type Study.—The type-study method is predicated upon a detailed study of a given subject as representative of other similar subjects. It affords opportunity for the presentation of a wealth of descriptive content in contrast with great condensation. It may be correlated readily with any of the other methods—regions, political units, problems, etc. Illustrations of type subjects are the following: A Cotton Plantation; A Corn Belt Farm; The Minneapolis Flour-milling Center; Irrigation in the Salt River Valley; The Lower Mississippi; New York City; A Coal Mine in Illinois. Opponents of the plan hold that the "types" commonly selected are not typical of the subject as a class but are outstanding exceptions. The basis of this criticism is more apparent than real, and the criticism may be avoided by selecting a subject that presents normal conditions. Furthermore, the beginning student, at least, can more easily grasp the geographic principles involved in a clear-cut illustration than in the more complex presentation of the entire class, and further study will enable him to make appropriate adaptations.

The Topical Outline.—The topical outline is in universal use. It is a logical, systematic arrangement of a body of material and assures the inclusion of all important elements with a minimum of duplication. It may be worked out by the instructor, by the student, or by both working together. The major elements common to any areal study are location, size, surface, drainage, climate, native vegetation, population, and human activities. The sequence should be varied in dealing with the different problems undertaken, to avoid monotony of treatment. When used habitually, the topical outline tends to an encyclopedic treatment of the geographic material with little or no attempt to differentiate as to importance of the topics in the outline. An outline is essential to the systematic study or presentation of any geographical subject, and is necessary, in one form or another, in any plan of organization followed, be it that of regions, problem-solving, type studies, or some other. The student without an outline of the subject being presented is lost.

CORRELATION

Geography, as a science of relationships between natural environment and life, occupies a field that is exclusively its own, but it is related intimately with many other branches of knowledge, particularly with economics and history and other social subjects. Geography itself has many subdivisions, among which are economic, historical, and mathematical geography, anthropogeography, and plant geography, each of which stresses a particular phase of the subject. Geography provides a wide unification of human knowledge as it traverses many fields. It offers a greater opportuity for the study of man in all his environmental relations than any other subject. However, geographic environment does not explain everything. In fact, it is highly probable that no one thing explains any particular phenomenon in life. Life is complex, and there are a multitude of influencing factors, including the human element itself. These should all be recognized and given due weight. When emphasis in historical study was shifted from an account of important historical events in chronological order to an interpretation of those events, geographical data were utilized extensively. This does not mean that the history student became primarily a geographer. He still retained a viewpoint characteristically historical. Conversely, when the geographer uses data of history, botany, or economics, he has not thereby become an historian, botanist, or economist. It follows, therefore, that when any related data will enable the student to gain a more comprehensive knowledge of a geographic subject, the use of such data is desirable.

TESTING RESULTS

Geography teaching involves establishment of objectives, selection of suitable material, organization and presentation of material, testing to ascertain the results of instruction, and development of additional means to overcome failure. Aiding others to acquire knowledge and skill is a process of teaching and testing, repeated many times if necessary. Too often there is no additional teaching on the same subject after tests reveal failure of previous instructional efforts. Secondary school and college instructors seem prone to place all blame for failure upon the student.

Tests, as teaching aids, may be prepared to determine progress in the acquisition of facts, ability to interpret geographical facts, and ability to use geographical data effectively. Any competent instructor can

prepare a series of such tests for each course and measure the results of his instruction. Testing the acquisition of facts—factual geography—is relatively simple and is the most commonly used form. The process is chiefly mechanical and the results are easily measured. Ability to interpret and to use geographical data effectively are not easily reducible to accurate mathematical measurement. These abilities are the more significant objectives of instruction in geography and their measurement deserves thoughtful consideration.

There is an element of chance in all tests. But series of tests, the use of which will reduce the chance element to a minimum may be developed as instruction aids, along various lines. Many types of tests have been devised, such as the True-False, Correct and Best Answer, Matching, Completion, Mutilated Sentence, and Alternative Answer devices. Most of these have been worked out for use in the elementary school, but the schemes are equally applicable to secondary schools and colleges. The following will serve as an illustration of the True-False type. It gives some measure of ability to judge the accuracy of geographic statements—thinking—as well as of acquired information. College students should be able to read a fairly complex sentence or paragraph and determine the accuracy of the statement as a unit. It is not necessary, with such students, to limit the elements of a True-False test to a single statement. The following test has been given to several hundred first- and second-year college students. However, it has not been standardized. In fact, most so-called " standard tests " in geography are " standard " chiefly in their standard weakness.

A True-false Test on North American Subject Matter

(Each statement must be considered as a unit.)

1. North America is the third continent in size as it is larger than either Europe or South America, and larger than Europe and Australia combined.
2. Longitude is one of the most important factors affecting the usefulness of a continent to man.
3. Nearly all parts of North America are comparatively close to the ocean because its coast line is longer than that of any other continent except Asia.
4. The climate of the United States varies from true tropical on the Gulf (of Mexico) coast to sub-Arctic in Maine.
5. North America has the largest reserve of deciduous and coniferous forests of any continent with the possible exception of Asia.
6. North America is more favorable to man than is any other continent because sufficient heat and rainfall for the profitable raising of some kind of crop prevails throughout its area during the summer months.
7. The large extent of lowlands; fertile and varied soils; extensive coastal plains;

long navigable rivers; varied mineral resources of high quality, are factors favoring North America as a home for man.

8. The forest resources, clay resources, and building stone resources of the Great Basin Plateau region far exceed in significance any disadvantages that the region may have.

9. The three most important factors in the location of the United States are: (1) mid-latitudinal position, (2) in the wide part of North America, (3) across narrowest ocean from Europe.

10. The forests of the United States are now being cut for lumber purposes four times as fast as they are growing.

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CHAPTER I

NORTH AMERICA AS A HOME FOR MAN

The Normal Growth of Population.—In continents and countries long occupied by nations and races, i.e., "old" countries and continents, the density of population generally may be taken as a measure of the fitness of such areas to be homes for man. Regions of meager resources have few people per square mile. Those in which the resources are varied and plentiful have dense populations, provided economic development has kept pace with increasing population. In most old countries the adjustment of human activities to the physical environment is complete, or nearly so, and population has reached, or is approaching, the saturation point.

Curve *A*, Fig. 1, expresses roughly the normal growth of population.[1] War, pestilence, expansion of territory, loss of territory, discovery of new resources and new methods of utilizing resources would modify such graphs for individual countries, yet those would be called departures from the normal. The population increase in a country having a normal development is at first very slow, as the curve shows; later the growth gains momentum; and this period is followed by a decreasing rate of growth, reaching, eventually, when the saturation point has been attained, a stationary condition.

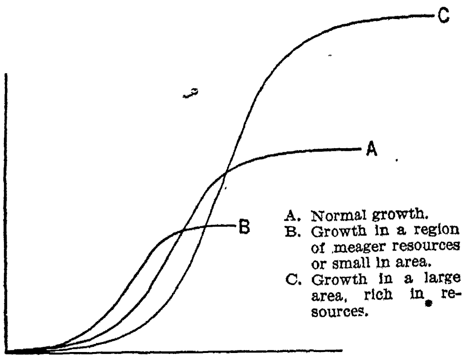


FIG. 1.—Curves of Population Growth.

The saturation point in regions of meager resources, such as Persia,

[1] The form of this curve is the work of Raymond Pearl of Johns Hopkins University. (Loc. cit., No. 16, Bibliography.)

Central Asia, or Arabia, or in regions small in area, such as Egypt, is reached in a comparatively short time. Population curves for such areas have the "plateau" of old age not far above the "plains" of youth, as shown in *B*, Fig. 1. Areas rich in resources, like France, Germany, Britain, Japan, and others, have been slow in reaching or approaching the saturation point for population; in these the "plateau" of old age stands

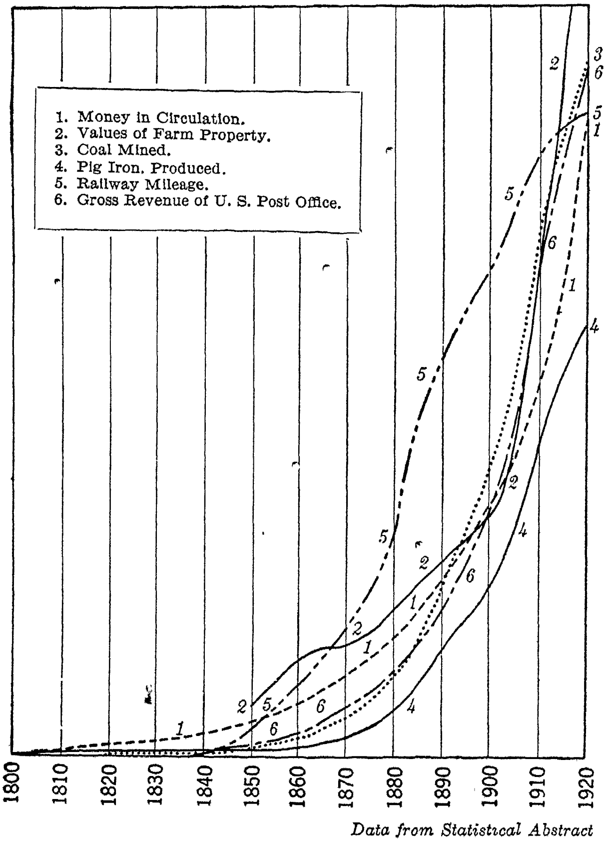


FIG. 2.—Some Typical Curves of Progress in United States.

The remainder of the continent show no such rapid progress. The growth in Canada has also been very rapid in recent decades.

far above the "plain" of youth and the total population that may be supported is large. Graph *C*, Fig. 1, may be taken as representing the curve of population growth of these major nations—past, present, and future. As for their present position, they undoubtedly are well up on the curve at the bend toward the horizontal. See Fig. 2 for graphs of progress in the United States.

The Population Curve for North America.—*What position does North America have on the curve of normal population growth? Will its curve be small, like A, the result of meager resources and rapid development, or will it take the broad, sweeping form characteristic of regions rich in nature's gifts?*

The character of our agriculture, the methods employed by our people in the exploitation of our forests and mineral resources, the rapidity of our economic and social changes, particularly in Canada and the United States, all stamp us (North Americans, in general) as a young people in the early stages of our adjustment to the physical environment. Although comparatively young, civilization in North America is well rooted. Nearly all the better areas or regions are already settled. There will be little advance of the frontiers of settlement shown in Fig. 3. The continent as a whole is undoubtedly in the late stages of youth, i.e., just beyond the upward bend in the normal curve, in the early stages of a period of rapid increase of population, and rapid economic development.

The height to which the increasing population will carry the North American curve will depend largely on the sustaining power of the land—the natural resources—and on the utilization of the economic opportunities offered. The valuable experience already acquired in agriculture, manufacturing, mining, trade, and commerce; the enterprise and intelligence of the people; and the educational facilities in existence insure the development of every resource, and to the limit, particularly as the pressure of population on the sustaining power of the land increases.[2] The future population of the continent, then, will depend largely on the extent of our resources, on the ability of North America to support people.

In geography, as in other sciences, it is customary when dealing with multiple factors to consider one factor at a time, forgetting for the moment all others, no matter how important they may be or what may be their effect on the one factor under consideration.

Land a Fundamental Resource.—Land is a fundamental resource, provided it fulfills certain conditions that render it of use to man. Land as here used connotes soil, that thin brown layer on which our agriculture, our grazing, and the production of our forests depend. The struggle for existence is, after all, largely a question of space—land, soil, minerals—for the production of the materials needed by man to satisfy his physical and higher wants. Land has during the whole history of

[2] For a very instructive presentation of the subject of settlement and immigration, read the article, "The Scientific Study of Settlement," by Isaïah Bowman, Geographical Review, Vol. XVI, No. 4, 1926.

civilization, and with all people, been the natural thing sought for and fought for. Land was the economic magnet that brought most of the

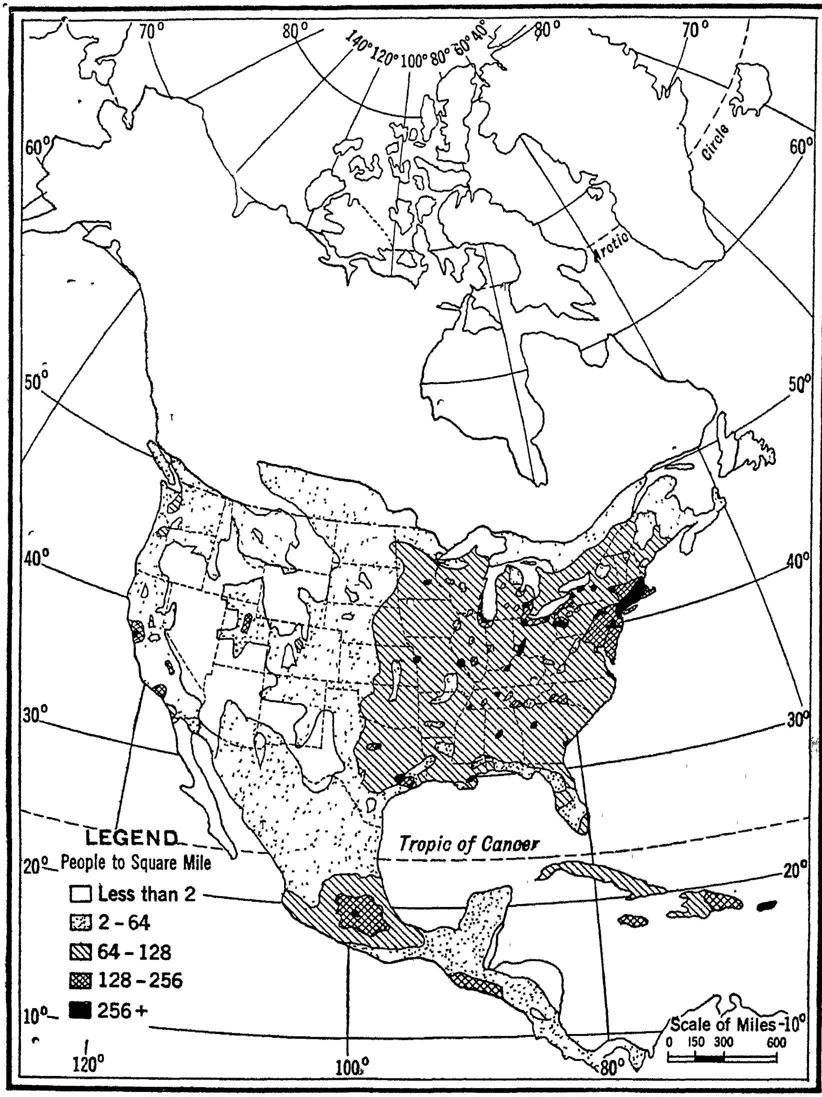


FIG. 3.—Density of Population in North America.

How do you account for the larger part of the population of the continent being in the southeastern quarter of English North America? What relations can you establish between occupations and density of population in the various parts of North America? See map of Plant and Human Use Regions.

Europeans to the continent of North America. Some came for political and religious liberty, some for the fish off the eastern shores, but more

came for the furs, the precious minerals, the ship-building materials of the forests, and agricultural land that they might consider their own. Furs, precious minerals, and virgin farm lands moved the frontier from the eastern shore of the continent to the Pacific.

As population increases, and it increases most rapidly where economic advantages associated with land are most abundant, the value of land becomes greater. The most valuable land to-day is in the more densely settled areas. Plots of ground in our larger cities purchased for $25 a century or less ago have market values to-day of $2,500,000 or more. Indeed, it is this increasing value of land that has brought prosperity and optimism to so many Americans. North America, largely because of its abundance of land and the tendency of this land to increase rapidly in market value as population increases, is, above most continents, the land of opportunity to land-hungry immigrants from the old countries of Europe.

The accompanying table gives the area of land of the continent, with the total population (some figures are little more than estimates) and the population density.

TABLE I

A COMPARISON OF THE CONTINENTS

	Area in Square Miles	Total Population	Population Density
Asia	17,200,000	900,000,000	52.3
Africa	11,600,000	142,000,000	12.2
North America	9,400,000	140,000,000	15.
South America	7,200,000	64,000,000	8.9
Australasia	3,300,000	9,000,000	2.7
Europe	3,900,000	460,000,000	118.
Polar Continents	5,100,000		
	57,700,000	1,715,000,000	

* The various sources presenting data on the area and population of continents show little agreement. Many estimates are included with compilations. The general practice of considering Europe a continent, in dealing with statistics is followed here.

North America, as the table indicates, stands third in area among the continents, but fourth in total population and third in density of population. Asia and Europe, as previously stated, are "old continents" and have the larger population, the former 6.4 times the population of North America, and the latter about 3.3 times. On the basis of mere area, North America, in comparison with the "old con-

tinents," offers great opportunities in land and has room for many more millions of people.[3] But mere area of land is no basis for estimating the capacity for population. It is available resources and the degree of their utilization that count.

The Population Map a Resource-utilization Map.—As stated in the first paragraph of this chapter, the distribution and density of population of a continent that has been long settled indicates, in a rough way, the extent to which man at present is utilizing its resources.

Civilized man has been in North America long enough to have become fairly well adjusted to its environmental conditions. The population map of North America (Fig. 3), therefore, may be roughly considered a resource-utilization map. In a new continent, the greatest degree of utilization is found in the more densely settled areas, the least in those scantily settled. It should be remembered that this map shows an adjustment to all the economic opportunities. It is the distribution and density of rural population in general that measure the degree of utilization of the soil. It is in the eastern part of English North America, the first section to be settled by northwestern Europeans, that man has made his greatest advance in civilization. Here is the largest compact population group on the continent. Here lives nearly two-thirds of the continent's population. Here it is that man is using, to a fuller extent than in any other section of the continent, the resources of his environment. If to this quarter of English North America we add the scattered population groups on the Pacific Coast and in Latin America, the remainder of North America is almost empty. *Why is so much of the continent so thinly peopled? What is there for these sections in the future?*

Climate as a Factor in Land Utilization.—Of all the factors conditioning land utilization, climate is the most important. No matter how rich the soil may be in mineral elements or how perfect the physiographic conditions, without favorable temperatures and moisture the land cannot be tilled or have productive agriculture. On the other hand, many poor soils will yield crops on an economic basis provided the climate approaches the optimum.

Climate is complex. It is a composite of temperature, rainfall, humidity, winds, pressure, and sunshine, all so intimately related that it is difficult to tell which element is dominating and determining the atmospheric condition. In some portions of North America it may be rainfall, or the lack of it, that is the dominating element; in others, temperature; and in still others, some one or more other factors.

For the sake of simplicity, temperature and rainfall are usually taken

[3] Comparisons are made with Europe and Asia because they have climates more nearly like North America than does South America, Africa, or Australia.

as the more important elements of climate, for all other elements hold a causal or resultant relationship to these two.

Temperature in its Effect on Land Utilization.—Figure 5 is a map of the Temperature Regions of North America. From a study of the legend and the discussion (pages 18 to 23) one can readily see why so few people to-day occupy the vast areas included in the **Always Cold** and the **Cold Winter and Cool Summer** regions. To this vast area must be added the northern half of the **Cold Winter and Mild Summer** region. Agriculture is impossible in these three sections, and without agriculture there can be little profitable development along any other lines. The **Cold and Cool** region has possibilities as a grazing area for the reindeer; but the best pastoral areas can support but few people to the square mile. In the northern half of the **Cold Winter and Mild Summer** region, lumbering and the collecting of furs will absorb the energy of the few people that can secure a living by these superficial types of occupation. It will be many decades before man is forced to these distant lands except to the eastern and western borders near the sea. This vast area, must therefore, remain practically unused in so far as climatic influences of conditions dominate land utilization. There are mineral resources, but these for the most part will be conserved for future generations because of their isolation.

A further comparison of the population map and the temperature-region map indicates clearly that in the southern half of the **Cold Winter and Mild Summer** region, and in parts of the other temperature regions to the south, man, where conditions other than temperature do not interfere, finds congenial conditions for utilizing the soil resources. This is shown by the moderate to dense population. In the more densely settled areas, manufacturing, mining, transportation, and other occupations engage the major attention of the people.

Rainfall as Affecting Land Utilization.—A comparison of the rainfall map, Fig. 9, and the population map (Fig. 3) shows conclusively that, in that portion of the continent having favorable temperatures, it is the amount of rainfall that largely determines where people may or may not live and, to some extent, determines how many may live. The 30-inch isohyet is roughly the western border of compact continuous settlement in eastern North America. Westward from the 30-inch line, the density of continuous settlement decreases; and between the 15-inch isohyetal in the Great Plains Region and the Sierra Nevada–Cascade Range people live in widely scattered settlements, the locations of which are quite largely determined by supplies of water sufficient for irrigation or by mineral deposits. Dry farming, where the rainfall exceeds 12 or 14 inches and evaporation is not excessive, attracts a few.

The arid area will always remain, relatively, one of the thinly settled portions of the continent. Dry farming is precarious. Estimates put the maximum area that may be irrigated at not more than about 5 per cent of the total arid area. About 2 per cent is now supplied with water.

Surface Features Affecting Land Utilization.—Plains have always been the seats of dense population groups and the centers of advanced civilizations. The plains of China, of the Indus, the Tigris and Euphrates, and the Nile all hold prominent places in history because the people that occupy them have made valuable contributions to developing world civilization. In North America to-day, it is almost wholly the plains lands that are occupied by the farmers of the continent. Here soil tends to be deep, leaching and slope wash are at a minimum, and there are few obstructions to the movements of man.

North America has large areas of plains, as the Great Central Plain from the Arctic to the Gulf, the Atlantic Slope, the Coastal Plains of Central America, and the large river plains like those of the Yukon, the Willamette, the Sacramento, and San Joaquin; but unfortunately a large part of the plains area has adverse climatic conditions, as previously discussed.

The intermontane plateaus that stretch from the Bering Sea to the Isthmus of Tehuantepec, in the western part of the continent, have surface features that offer few obstacles to their use for agriculture; but most of this entire area is, as previously shown, too arid or too cold for profitable farming.

Mountain areas, in contrast to plains, do not lend themselves to widespread agriculture and are as a rule but thinly peopled. Agriculture is confined for the most part to the valleys and basins, and it is largely the area and fertility of these that determine the number of people. The slopes unsuited to tillage are likely to be clothed with forests, even if the foothills and plains about are arid, and mountain pasture lands may be utilized by the cattle and sheep herder. Minerals and water power may also concentrate people at scattered points; and if the mountain regions possess beauty of scenery, tourists and students of nature are attracted. Because of the healthful, bracing air of such regions, health resorts are established in them. Yet none of these methods of utilizing the land resources offers favorable conditions for a dense population.

When the mountain areas of the continent are added to the large tracts that are too cold and the other large tracts that are too arid for farming, there remains probably not more than a third of the continent that may be considered ideal (relatively) for agriculture. (See page 10,

for other uses of the land.) One is surprised at the vastness of the area that is limited in its value to man because of adverse physiographic and climatic conditions. Yet the other continents, except possibly Europe, are in no wise superior to North America in this respect. A comparison of volume of some of the crops of the continents supports this generalization.

North America as an Agricultural Region in Comparison with other Continents.—Although younger historically than either Europe or Asia, smaller in area than Asia, and with a population much less than a third of that of Europe, and a seventh of Asia, North America ranks remarkably well in the production of farm crops. Only the widest generalization and conclusion may be made in such comparisons, for latitude positions and other conditions greatly affect the kinds of crops grown. These fundamental differences must be kept in mind in comparing the data in Table II.

TABLE II

ANNUAL WORLD PRODUCTION OF MAJOR CROPS BY CONTINENTS

Average for 1909–1913 (Pre-war Production)

	Wheat (Million Bushels)	Corn (Million Bushels)	Oats (Million Bushels)	Rice (Million Pounds)	Sugar (Thousand Tons)	Cotton (Thousand Bales)
North America	900	2700	1500	930	4165	13000
Europe	1200	530	1500	960	6670	———
Africa	73	100	27	1444	———	1500
Asia	350	95	110	109000	4320	4600
South America	185	180	55	290	560	———
Australia	85	10	15			

* These data are largely estimates. Not all countries are reported From Agricultural Yearbook, 1921.

North America leads the continents in the production of corn and cotton, surpasses Asia in wheat and oats, and produces three-fourths as much wheat as does Europe, the same amount of oats, and almost as much rice as Europe. Its corn crop is five times the corn crop of Europe, the next in rank among the continents. Corn is the outstanding crop of North America, and rice of Asia; and in these crops each leads the world. Can the 2,700,000,000-bushel (56 pounds to the bushel) corn crop of North America offset the 10,900,000,000-pound rice crop of Asia? Is the lead that Europe has over North America in wheat, oats,

rice, and sugar compensated for in our vastly superior production of corn and cotton? Are the few items used for comparison in the table sufficient in number to be made the basis of conclusions? These questions must be answered by the student to his own satisfaction. (See Fig. 16, a map of the Agricultural Regions of North America.)

Distribution and Growth of Rural Population in the Future.—As previously stated, the population frontiers of to-day block out in general the areas of denser population of the future. There will be a northward movement of the frontier in Canada, particularly in the Prairie Provinces to the east of the Rockies. The short growing season will limit the variety of crops and the number of people that may be supported. An expansion of dry-farming lands, the breeding of new varieties, or the introduction of new crops, will give sustenance to a few more millions of people than live at present in the semi-arid region. And the expansion of the irrigated area to its maximum will increase the present population dependent on irrigation by 100 or 200 per cent. It is evident, therefore, that it is in the humid lands of the continent, i.e., the Pacific Northwest, eastern United States, and nearby sections of Canada, the humid portion of Mexico and Central America and the West Indies, that most of the future growth in rural population must take place, in so far as this growth is affected or determined by land (soil). Figure 4 shows the probable ultimate use of the land in North America.

Other Resources Affecting Population Density and Growth.—There are elements of the physical environment of man, other than land (soil) that furnish him employment and profitable returns. Manufacturing, mining, transportation, trade, commerce, and the professions employ a large percentage of the people of the continent. For the continent as a whole, nearly half the population secure their living from these occupations. These are dependent to some degree on the products of the soil, for it is from the soil that all the people must be fed and from the soil that some of the factories must draw their raw products. The tillers of the soil furnish a market for some of the manufactured products of the cities. Railroads and ships transport the commodities of the farm; bankers handle much of the money of the farmers. The people in these occupations, however, are probably more dependent on mineral resources, the supply of power, and the natural facilities offered for transportation and communication, than on the soil.

The Mineral Resources of the Continent.—For none of the continents do we know the extent of the mineral deposits. Europe, the United States, and southern Canada are probably the best known geologically; yet in our own country new deposits of useful minerals are being found nearly every year. More than two-thirds of Canada is

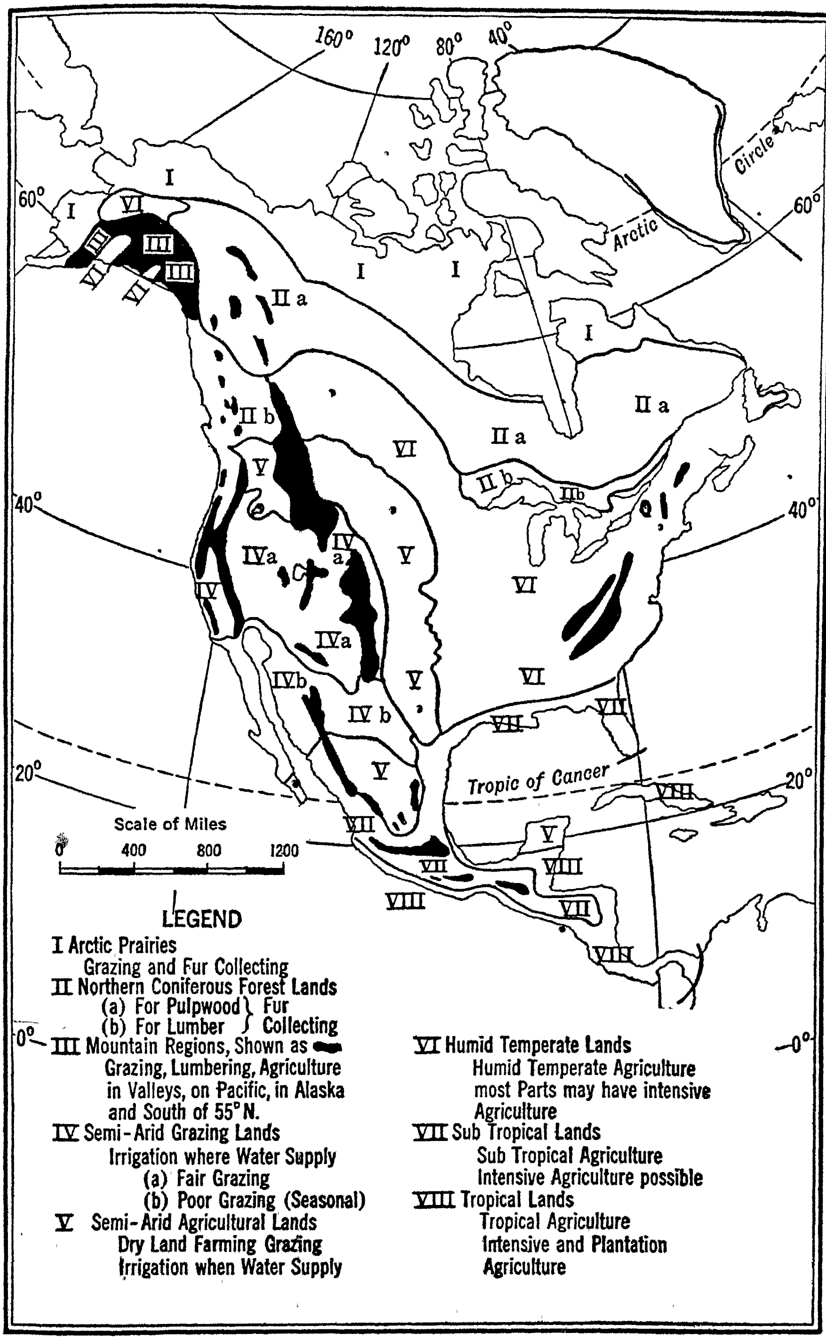


Fig. 4.—Plant and Ultimate Human Use Regions.

Although a large portion of the continent is unsuited for agriculture, very little is waste land, i.e., unsuited to any productive use. The cold and semi-arid grazing lands, mountain grazing, and forest lands and semi-arid agricultural lands will always remain the thinly settled portions of the continent; and the cold desert and dry desert lands practically uninhabited.

yet to be examined for minerals, and few geologists have ever worked systematically in the regions to the south of the United States.

The coal resources of the world are probably the best known, yet the available data are little more than estimates. Several authorities give North America 70 per cent of the world's resources of coal and the United States 50 per cent of the world's total.

TABLE III

Coal Resources of the World by Continents*

	Billion Tons
North America	4871
Asia	1900
South America	130
Europe	522
Australia	183
Union of South Africa	62
(No estimates for other portions of Africa)	

* Atlas of Commercial Geology, U. S. G. S.

It is only in North America and Europe that mining is active at present. In 1923 the total coal mined in the world was 1,359,000,000 tons, of which North America produced 611,000,000 tons (United States, 595,000,000 tons); Asia, about 50,000,000; Africa, 11,000,000; Australia, 13,000,000; and Europe, the remainder.

Petroleum resources are so difficult to determine that estimates are rarely given even for our own country; and the same may be said of natural gas. The best that can be done to give an idea of the distribution of oil is to present the yearly output of the various countries. This gives a poor idea of potentialities, for the continent that is actively pumping to-day will no doubt be without resources within a few decades. Moreover, little is known of petroleum resources outside North America and Europe. New pools may yet be discovered even in this continent. The United States in late years has produced more than 72 per cent of the oil of the world; Mexico, about 5 per cent; and the entire continent, about 77 per cent. The United States consumes about 65 per cent of the world's production of natural gas.

In considering the population of the future in North America, we think chiefly, of coal, petroleum, and gas, as power resources. To these must be added water power. North America holds third rank among the continents in potential water power;[4] but in developed water power

[4] The significance of the tremendous power resources of North America derived from the utilization of coal, natural gas, petroleum, and water power is realized only

it stands first, having more than half the developed water power of the world.

TABLE IV

THE DISTRIBUTION OF WATER POWER OF THE WORLD BY CONTINENTS

	Potential H.P.	Developed
Africa	190,000,000	11,000
Asia	71,000,000	1,160,000
North America	62,000,000	12,210,000
(United States)	28,000,000	9,243,000
South America	54,000,000	424,000
Europe	45,000,000	8,877,000
Oceanica	17,000,000	147,000

* Data from Atlas of Commercial Geology. The data in Table IV were revised in 1916 and are the last available for comparison of continents. Official figures for the United States, issued January 1, 1927, show 11,720,000 developed, and a potential of 34,818,000 available 90 per cent of the time.

Among the more valuable metallic minerals used in the great industries of to-day are iron ore, copper, zinc, and bauxite. The extent of the reserves of these in North America is unknown, as previously stated; but it is known that the United States alone, in late years, produces 40–45 per cent of the iron ore of the world, about 50–60 per cent of the copper, 35–40 per cent of the zinc, and 40 per cent of the bauxite. We have deposits of salt, building stone, cement-making materials, and clays of many sorts sufficient to last for hundreds of years at the present rate of consumption.

Phosphate rock, on which agriculture must depend more and more in the future, is found in great quantities in North America, the United States producing 43 per cent of the world's output. In recent years potash has been discovered (not yet fully explored) in Texas and New

when considered in comparison with human power, the power now characteristic of the tropics, the East, and to some extent of many of the countries of Europe. Engineers have found that the energy stored up in 2 pounds of coal, used in an engine of 10 per cent efficiency and expended through a day, will do the work of one man, and that the energy output of an average workman is about a seventh of a horse power. The daily output of the coal mines of the United States (1½ million tons) is equal to the energy (based on the above figures) of 1,500,000,000 men; and the developed water power that of 82,000,000. With three 8-hour shifts during the 24 hours the human equivalent becomes 250,000,000.

Mexico in quantities that may rival the rich deposits of Germany, which have long been the basis of an active chemical industry. The United States holds first place in the production of thirteen out of the thirty better-known minerals mined. Manufacturing, then, can go on apace in North America. With a large share of the power resources of the world; with large areas of almost virgin agricultural lands producing their share of the world's agricultural products and capable of several times the present output; with a large part of the world's iron ore, copper, zinc, nickel, sulphur, bauxite, and phosphate; and with some of the largest stands of timber to be found in any continent, the future is assured for both mining and manufacturing.

Natural Conditions Affecting Transportation.—Does the continent offer any barriers to man's efforts in providing transportation facilities for the movement of these products of the farm, mine, and factory? What are the advantages, if any? The major lines of traffic in both Canada and the United States are east and west, that is, across the trend of the mountain ranges of the continent. There are, however, large areas of plains to be traversed, for the build of the continent is simple—three main mountain systems with a north-south trend widely separated by plains and plateaus. Mountain passes are numerous in the ranges and, except on the Pacific Slope and in eastern Colorado, in general, ascent to the passes is easy. Many engineering difficulties were encountered in laying out the great transcontinental lines, yet most of the problems were readily solved. To-day North America has the greatest railroad mileage of any of the continents. The United States has nearly half the world's mileage (263,000 miles out of 739,000 for the world); and the Canadians, on the basis of population, are the greatest railroad builders of the world, 40,000 miles having been built by a nation of about 9,000,000 people.

The mileage of navigable waterways of the continent, although little used except in the case of the Great Lakes and the St. Lawrence River, is large. The Mississippi system has about 2500 miles of water with a depth of 6 feet or more the year round. The total mileage of navigable rivers in the United States is put at 26,400, but a portion of this is suited only for shallow-draft boats. Canada has few long rivers or inland waterways except the upper Yukon and the St. Lawrence and the Great Lakes. All of these are shared with the United States or connected with its waterways. The St. Lawrence and the Great Lakes form the greatest inland waterway in the world. Ocean-going boats with maximum draft of about 13 feet and length of 260 feet can pass through the St. Lawrence River canals and tie up at most of the docks of Fort William, Port Arthur, Duluth, or Chicago; and the "20-foot channel"

(minimum depth of 20 feet) in the connecting rivers of the Great Lakes enables larger boats to carry huge cargoes at a cost about half that of rail transportation. That part of the continent south of us is practically without navigable rivers, but the extensive coastline more than compensates for navigable rivers such as exist farther north.

Contact with foreign markets is essential for all progressive nations, in order that they may purchase products that are not raised in sufficient quantity at home, and develop foreign markets. All nations strive to reach the ocean and its great traffic routes. Connection between land traffic routes and ocean traffic routes is through the harbors of the continent, and these must be readily accessible from the interior. To what extent does North America possess these natural advantages?

Commodities do not move to and from the inhabited portion of the great interior of North America with as great ease as in Europe, for our continent does not possess numerous deep bay, gulf, and other sea indentations. Moreover, the usable coastline of North America is greatly reduced in length by the ice-bound Arctic. The mountains bordering the Pacific Coast reduce the contact with the interior to a few passes, but these are well distributed and low. Skagway, Prince Rupert, Puget Sound, and San Francisco are among the best harbors of the world. Portland's asset is a drowned river mouth and easy access to the interior; but Los Angeles has little to build on except enterprise, sheer pluck, and influence at Washington, D. C. The Atlantic Coast and the Gulf offer abundant ocean contacts. The Gulf of St. Lawrence and the harbors of Halifax, Boston, New York, Philadelphia, and Chesapeake Bay are the natural gateways of the eastern coast, and all these important harbors are being utilized. Few or no harbors satisfy the demand of modern shipping without improvements of some sort. Particularly is this true of the harbors of the United States south of Chesapeake Bay. Jetties or dredging, and generally both, have provided gateways at Wilmington, Charleston, Jacksonville, Pensacola, Mobile, New Orleans, and Galveston–Houston. All these have easy communication with the interior. The West Indies have many natural harbors, so excellent as to be contended for by several of the great commercial nations; but at most ports of Mexico and Central America contact between ship and shore is generally made by lighters. Expensive harbor works have been provided at a few of the ports.

North America a Continent of Almost Untouched Resources.— Except for the rapidly disappearing forests and the greatly reduced reserves in a few minerals like zinc, lead, oil, and gas, North America may well be considered a continent in which the resources are almost untouched. We have been mining in recent years more than 550,000,000

tons of coal annually in the United States alone and have exhausted our total resources by about 20 billion tons, yet this is much less than 1 per cent of the total known reserves. Figures for Mexico and Canada are not available, but were they obtainable they would alter the above deduction for the continent but little.

As for reserves in iron ore, little can be said that is more than an approximation. The original deposits were probably not less than 10,000,000,000 tons of available ore, i.e., ore that may be mined and smelted economically, and several times this amount of low-grade ore. With a total exhaustion up to 1925 of probably not more than 1,500,000,000 tons of high-grade ore, we may well say that the resources of this useful mineral are almost untouched.

The story is quite different with petroleum and gas. The life of these, if we may believe the authorities, is probably not more than a quarter of a century. Great reliance, however, is being placed on the immense deposits of oil shale of the West, to supplement the petroleum when higher prices will permit productive distillation.[5] The increased use of by-product plants in the making of coke will atone, to a very limited degree, for the depletion of the natural-gas resources. Copper can be used over and over again, and the stock of "scrap copper" is increasing; but zinc used once is for the most part used for the last time.

The great store of known metallic minerals of Canada has been worked for only a few years; and if the unexplored portions of that country prove as rich in minerals as the southern explored area, it will prove to be one of the greatest mineral regions of the world. Although mining has been active in Mexico for four centuries, scarcely more than a beginning has been made.

The Population of the Future.—Since the beginning of colonization of North America, land and agriculture have dominated in the economic activities of the people. The farmer has swept from the Atlantic seaboard to the Pacific in search of land, cheaper and better than that he had just left. The abundance, and therefore cheapness, of agricultural land has led to superficial utilization. Lands have been exhausted, abandoned, and left to wash and gully; but fortunately the area wholly destroyed for agricultural purposes is small. Although we have pushed our agricultural frontiers almost to the limit of usable lands, we still have much to learn before we can secure the yields of farmers in the "old countries" of Europe and Asia. Intensification is being practiced in only a few sections outside the dairy, gardening, and fruit-growing regions. When the density of population becomes great enough to

[5] At the time of writing, announcements have been made of discoveries of methods of producing gasoline from coal. Consult recent literature.

the temperate regions, the frigid zone, but always with a feeling of the inadequacy of the age-old terms to express climatic conditions. So also must sea level isothermal maps, conceptions of the meteorologists, be discarded, for man carries on his activities on the surface of the earth and geography is a study of man's activities as affected by the physical

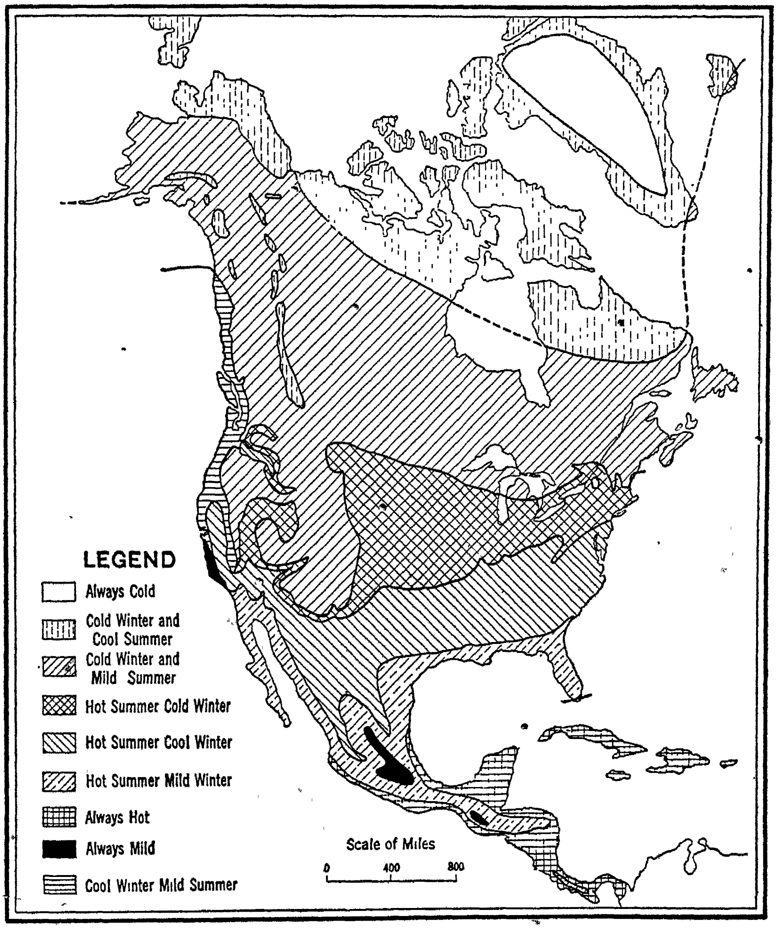


FIG. 5.—Temperature Regions of North America.

environment. Maps of mean annual temperatures, it is being recognized, have little value in presenting the geography of regions. Surface isothermal maps of the warmest and coldest months or for summer and winter, and surface temperature-region maps are now the chief visualizing devices used. A surface temperature-region map is used in this book.

THE TEMPERATURES OF THE CONTINENT

The Temperature-region Map.—The temperature-region map, Fig. 5, shows surface temperatures grouped into regions. The regions are bounded by selected isotherms, the 32°, 50°, and 68° for the coldest month, and the 32°, 50°, and 68° for the warmest month. January is taken as the coldest, and July as the warmest month. The two sets of isotherms are, after all, but one set which migrates northward and southward with the sun. On the map, the 32°, 50°, and 68° isotherms are shown in their January and July positions. Each region is designated in such a way that the temperature conditions of both winter and summer are indicated, the coldest and warmest month giving the temperature characteristics of the winter or summer season. The temperature regions are the areas between the isotherms. This arrangement of isotherms gives nine temperature regions for the world. Because of the great latitude extent of North America, its latitude position, and its large area, the whole series of regions is found in this continent.

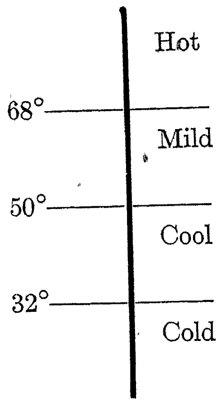


FIG. 6.—Four Types of Months.

The vertical line may be thought of as a thermometer scale showing monthly averages.

The Types of Months.—The nine regions are a combination of but four types of months, cold, cool, mild, and hot. The temperature range of each of these types is indicated by the diagram. Fig. 6, which may be thought of as a thermometer scale showing monthly means with three points, 32°, 50°, and 68°, indicated. A month with a mean temperature above 68° is considered a *hot* month. If the mean lies between 50° and 68°, it is a *mild* month; between 32° and 50°, a *cool* month; and below 32°, a *cold* month. It is the average temperatures of January and July at any place that determine the temperature region in which that place falls.

In what temperature region is each of the following cities, using the January and July averages as criteria?

	January	July
Albany, N. Y.	23°	73°
Bismarck, N. Dak.	8°	70°
El Paso, Tex.	44°	80°
Helena, Mont.	20°	66°
Knoxville, Tenn.	39°	77°
Portland, Ore.	39°	67°

The Sequence of Temperature Regions.—In the portions of the continent having continental temperatures, the sequence of temperature regions from north to south, with temperature conditions, are as follows:

1. Always Cold.—No month has a mean temperature above 32°. A place whose July is 32° would be on the boundary of the region. *A* and *B*, Fig. 7, are typical curves of places in this region. Curve *B*, Fig. 7, is for a place near the boundary of the region. The boundary of this region is 32° for July.

2. Cold Winter and Cool Summer.—The January temperature at any place (refer to Fig. 6) is below 32°, and the July lies between 32° and 50°. Places and areas near the northern border will have several months below 32° with only one or two *cool* months. Near the southern border there will be several *cool* months. *C*, Fig. 7, is the curve of a

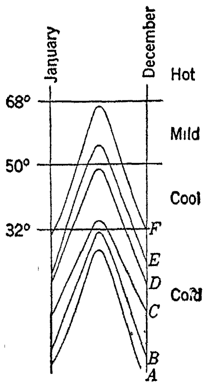


Fig. 7.

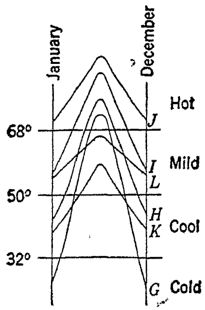


Fig. 8.

place near the northern border of this belt or region; and *D* that of one near the southern border. The equatorward boundary of this region is the 50° isotherm for July.

3. Cold Winter and Mild Summer.—The January average at any place is below 32° and the July between 50° and 68°. *E*, Fig. 7, is the curve of a place near the southern boundary of this region. The equatorward boundary is the 68° isotherm for July.

4. Hot Summer and Cold Winter.—January is below 32° and July is above 68°, for all places in this region. The southern boundary is 32° for the coldest month. A place with a July temperature of 68° would be on the northern border; such a place would be likely to have two or more months below 32°. A place with a January mean of 32° would be on the southern border. The monthly temperatures at Chi-

cago, which has an intermediate location in its temperature region, are as follows:

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
25°	27°	35°	46°	58°	67°	71°	70°	64°	54°	41°	31°

Chicago thus has two *hot* months and three *cold* months. Curve *G*, Fig. 8, is for Chicago.

5. Hot Summer and Cool Winter.—The July average in this region is hotter than in the region to the north, and there are more hot months; January has a temperature between 32° and 50°.

The mean monthly temperatures for Louisville, near the northern border, give an idea of the temperature conditions throughout the year:

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
34°	37°	45°	56°	67°	75°	79°	76°	70°	59°	47°	38°

There are four hot months and five cool months.

Vicksburg, Miss., is near the southern border of this region. The temperatures are as follows:

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
48°	52°	58°	66°	73°	79°	81°	81°	76°	67°	57°	50°

How many hot months? How many cool? *H*, Fig. 8, is a temperature curve for a place in this belt.

6. Hot Summer and Mild Winter.—The temperatures at San Antonio, Tex., are typical of places in this belt that have a continental climate. The means of the months are as follows:

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
51°	54°	62°	69°	75°	80°	82°	82°	77°	69°	59°	53°

How many hot months? How many mild? Is *I*, Fig. 8, for a place farther north or farther south than San Antonio?

7. Always Hot.—This region is on the lowlands of North America, mainly southward from the location of the 68° isotherm for the coldest month. Its southern limit is the 68° isotherm for July. It therefore continues on into South America. Key West, Fla., is the only city in the United States in this belt. What other parts of North America are in the **Always Hot** region? (*J*, Fig. 8.)

Effects of Altitude.—In the mountain and plateau areas of North America the boundaries of the temperature belts are in much lower latitudes than on the Great Central Plain and the Atlantic Slope. There is even a slight equatorward deviation of some of the isotherm boundaries in the Appalachian Highlands. Why do they deviate equatorward in mountain and plateau areas?

Any of the higher mountains in the portion of North America that has continental temperatures and perpetual snowfields have on their slopes all the temperature regions that occur between the base of the mountain and the center of Greenland.

The Sequence on the Western Border of the Continent.—The Pacific Ocean greatly moderates the temperatures of places and areas on the western border of the continent. The map shows that the **Hot and Cold** region does not come to the coast, neither does the **Hot and Cool,** and that the **Cold and Mild** region is separated from the ocean, from Sitka southward, by the **Cool Winter and Mild Summer** region, in which the mean of January does not go below 32° nor the mean of July above 68°. This region lies oceanward from the 32° isotherm for January and northward of the 68° isotherm for July. Curve *K*, Fig. 8, is for a place in this region.

Farther south than the **Cool and Mild** region (yet overlapping it for some distance) is the **Always Mild** temperature region, *L*, Fig. 8. This lies on the western slopes of the Coast Range from San Francisco southward to Los Angeles, seaward from the 50° isotherm for January and north of the 68° isotherm for July. In the **Always Mild** region the means of the months lie between 50° and 68°. The mean monthly temperatures for San Francisco at the northern border of the region are as follows:

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
50°	52°	54°	55°	57°	58°	58°	59°	61°	60°	56°	51°

The Migrations of the Isotherm.—The 68° isotherm on the lowlands of eastern North America migrates, from winter to summer, in response to the northward-moving sun, from the tip of Florida to the Lakes Region; the 50° from Mobile Bay to Hudson Bay; and the 32° from the Ohio River to central Greenland. The whole set, 68°, 50°, and 32°, shifts so far north from winter to summer that the isotherms of the warmest month lie wholly north of those for the coldest. There is no crossing of the July and January isotherms. On the western border of the continent, oceanic retardation checks the northward migration of the 68° isotherm and the southward migration of the 32° and 50° isotherms. The result is that the 68° isotherm for the warmest month cuts across both the 32° and the 50° for the coldest month. It is the crossing of the January and July isotherms that gives two regions on the Pacific Slope, unlike those to the east in trend, and range of temperature. (See *Annals of Association of American Geographers*, Vol. 16, No. 3, Sept., 1926, for a complete discussion of the Temperature-region Map.)

THE RAINFALL OF THE CONTINENT

The Map of Annual Rainfall.—The map of annual rainfall of Nor
America, Fig. 9, shows a long, narrow strip bordering the Pacific fro

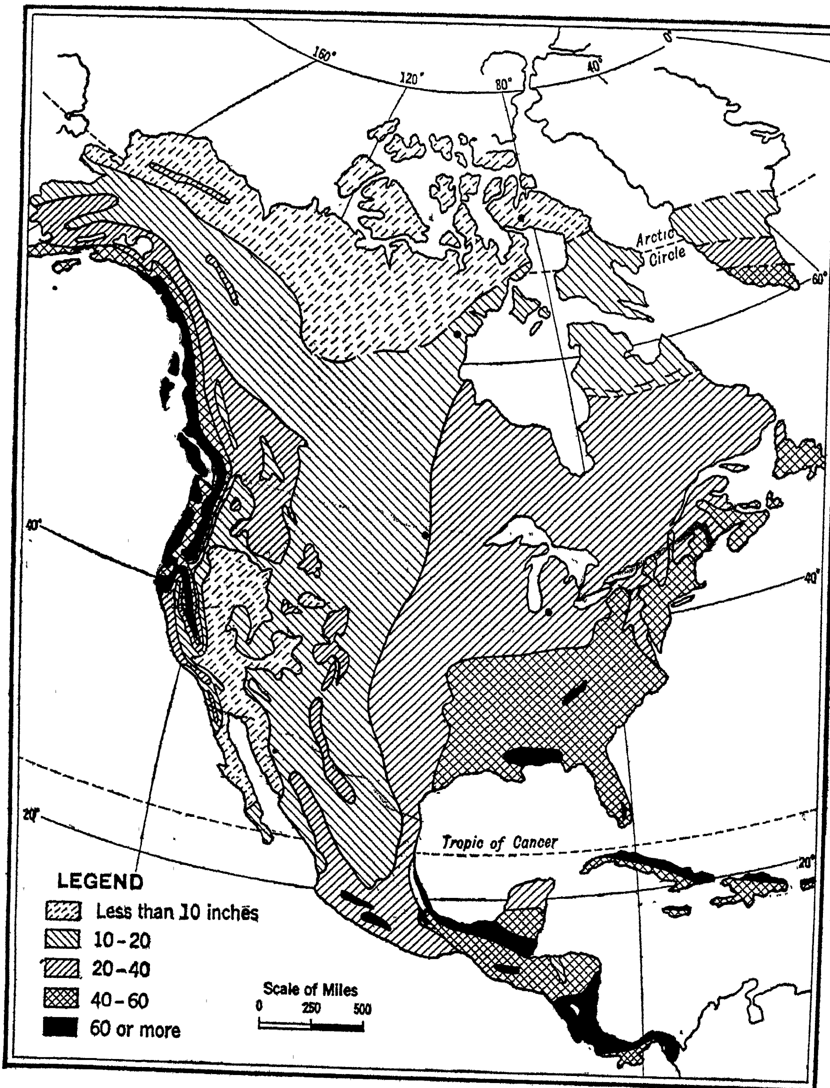


FIG. 9.—Annual Rainfall of North America.

40° N. to 60° N., having 60 inches of rain. Bordering this section of very heavy rain are strips, each with decreasing amounts, lying to the east-

ward. Most of the western highland and mountain area and the Great Plains have less than 20 inches; some areas have less than 10 (very scant), and some more than 20. The southeastern third of the continent has 20 inches or more, and the southeastern quarter of the United States has 40–80 inches. From the Gulf of Mexico northward in the eastern half of North America, there is a decreasing amount of rain. On the other hand, from about the parallel 23° southward in Mexico and Central America, there is an increasing amount. These facts of rainfall distribution are phases of geography. The explanation of these facts belongs, strictly speaking, to meteorology. Geography, therefore, does not call for an explanation of the distribution of rainfall. However, the factors fundamental to rainfall distribution are generally considered, by geographers, because the facts of distribution are more readily remembered if the reasons are known. It is the function of science not only to classify facts but to explain facts and phenomena. It is quite easy for the geographer to pass from the explanation of the relationship of life responses and physical environment to an explanation of the phenomena of the physical environment.

A knowledge of the major winds and the distribution of highlands, lowlands, and bodies of water as sources of moisture helps greatly in understanding the rainfall distribution.

North America north of 30°–35° N. latitude is in the belt of the *Westerlies*. South of 25°–30° the *Northeast Trades* prevail. Northern Mexico and southwestern United States form an area that is debatable ground between the *Westerlies* and the *Northeast Trades*.

It is the west wind from off the Pacific that gives the very heavy rainfall on the Pacific Coast. The air, laden with moisture, is adiabatically cooled as it moves up over the Coast Range and again over the still higher Cascade–Sierra Nevada Range, and rain falls. The air descending on the eastern slope is warmed and becomes moisture-absorbing rather than moisture-giving. East-facing slopes (leeward) of these mountains, therefore, have less rainfall than west-facing (windward), yet are not so dry as the leeward lands at lower altitudes because the clouds that precipitate the moisture on the windward slopes are carried over beyond the crests of mountain ridges before the air begins its descent.

Most of the plateau between the Pacific Ranges and the Rockies lies much below the level of the mountains to the west; it is therefore a region of low precipitation. The driest sections lie just to the east of the highest portion of the Pacific Ranges.

There is rain on the Southern Rockies because many mountains stand even higher than the High Sierras. The Northern Rockies,

although lower in altitude than the Southern Rockies and the still lower mountains of Idaho and northern Oregon, are relatively well rained on, chiefly because the Pacific ranges northward from 45° are less of a barrier to Pacific Ocean air than the mountains farther south. East of the Rockies, the eastward-moving air descends, is warmed, and becomes moisture-absorbing.

Since the eastern half of North America, north of 25° N., lies at a lower altitude than the western mountains and plateaus, how is it that the *Westerlies* bring rain to it and spread this rain copiously over a large area?

It is the low-pressure whirls, great eddies of air moving eastward and northeastward, largely from the Pacific, a few from the Gulf of Mexico and the Caribbean, across North America in the belt of the *Westerlies*, that give rain to the continent north of 30° to 35° N. latitude. Air moves in to these low-pressure eddies from all points of the compass and is gradually forced upward. This upward-moving air is cooled by expansion, and moisture is precipitated. In the western half of North America, the rain-giving winds are moving from the Pacific to the Low. In the eastern half, it is the winds from the Gulf and the Atlantic that bring the moisture. The Rockies, in a rough way, act as a great divide in the movement of the moisture that comes from the oceans and falls as rain. A Low on the western border of the Great Central Plain to a large degree draws in dry winds from the west; but if this Low is well developed it may affect the movement of air 800 miles or more to the east and southeast, even as far as the Gulf or the Atlantic. Moisture-laden air starts from these bodies of water toward the center of the Low. While this air is moving northwestward the Low is moving eastward; and, by the time Gulf and Atlantic air gets to the Low center, the latter has traveled several hundred miles from the western margin of the Great Central Plain. The western margin of the Great Central Plain is, therefore, semi-arid. The water that falls as rain in Iowa for example has probably not come directly from the Atlantic or the Gulf. A large part of it is re-evaporated moisture from previous rains.

Low temperature, and thus limited capacity of the air or space for moisture, is the chief reason for the scant rainfall of the Arctic Slope. On the other hand, it is the high moisture capacity of the air in the **Always Hot** region of North America and the *Trade Winds* (for the most part) that give moderate to very heavy rainfall in southern Mexico, Central America, and the West Indies. Windward slopes have the heavier rainfall. Some of the summer rain in Middle America comes from the northward-moving *Doldrum* belt.

Seasonal Distribution of Rainfall.—The seasonal distribution of rainfall is of great importance to the farmer. Thirty inches of rain, with a

large fraction coming in frequent gentle showers during the growing season, may provide more moisture for crops than 50 inches occurring largely during the late fall and winter. Figure 10 reveals at a glance

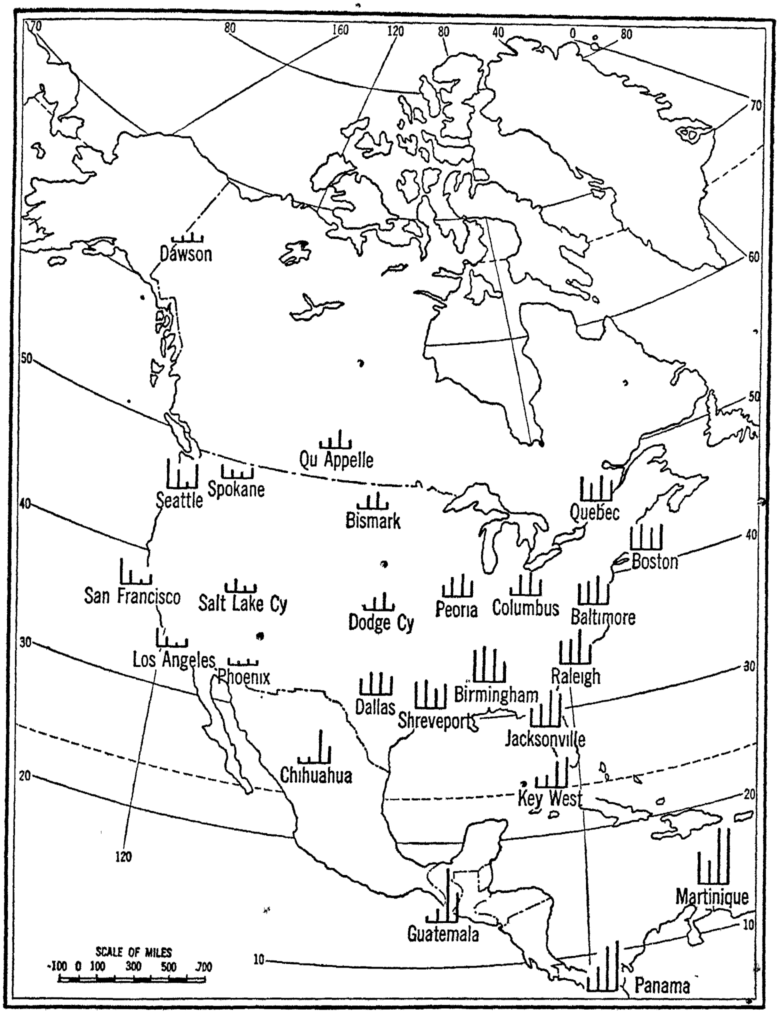


FIG. 10.—Seasonal Distribution of Rainfall at Selected Stations.

The first vertical line in each group is for the winter (December, January, and February), the second for spring, etc. Seasons and months follow in regular order

In what season does the Pacific Coast get most rain? When is the rainy season in the northern interior of United States? The Northeast and the South?

the seasonal distribution of rainfall at a few selected stations in North America. From this it is seen that the Pacific Slope of North America

and a part of the bordering plateau have a rainy winter. The seasonal distribution at Los Angeles and San Francisco may be taken as typical of southern California. At the former city, only 0.1 inch falls during June, July, and August, and only 1.8 inches from April 1 to September 30, inclusive. The rainfall for the year is 15.6 inches. San Francisco has 0.2 inch in the three summer months and 3.1 inches for the six months from April 1 to September 30. The mean annual is 22.3 inches. Farther north, the summer precipitation increases, but still winter rains dominate. Seattle has nearly 37 inches of rain; but only 2.9 inches fall in the three summer months, and only 9.8 inches from April 1 to September 30, inclusive. (Study Figs. 11 and 12.)

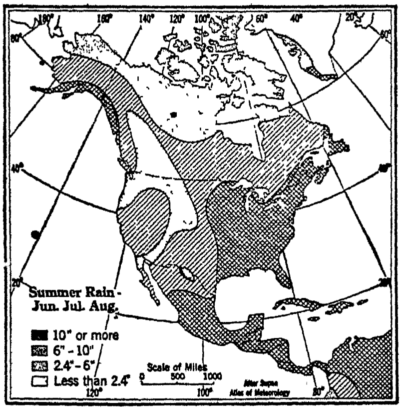


FIG. 11.

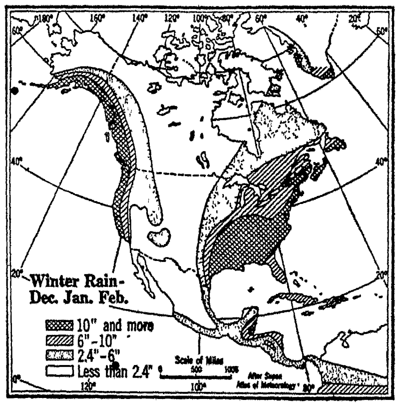


FIG. 12.

The map (see also maps of summer and winter rain) shows that much of the interior, east of the Rockies, has more rain in the spring and summer than during the other two seasons; that more rain falls during the summer months in the Gulf and South Atlantic states than at other seasons; but that there is a fairly even seasonal distribution in the northeastern United States.[1] Mexico, Central America, and the West Indies have their wettest season in summer.

The Climatic Regions of North America.—Climatic regions, as shown in Fig. 13, are largely a combination of temperature and rainfall regions, but seasonal distribution of rain and the rate (known or probable) of evaporation are given due weight. Therefore, isotherms and isohyets constitute for the most part the boundaries of the regions, and the names of the regions express both rainfall and temperature conditions. First

[1] For a complete discussion of seasonal rainfall see Chapter IX, Ward, The Climates of the United States.

of all, the higher mountain areas are set aside as forming a distinct type of climatic conditions. Some small areas, even though they have fairly well-defined isothermal and isohyetal boundaries, are eliminated in order to reduce the number of climatic regions to a minimum. For example, the Humid Intermediate Region is that portion of the **Hot Summer and**

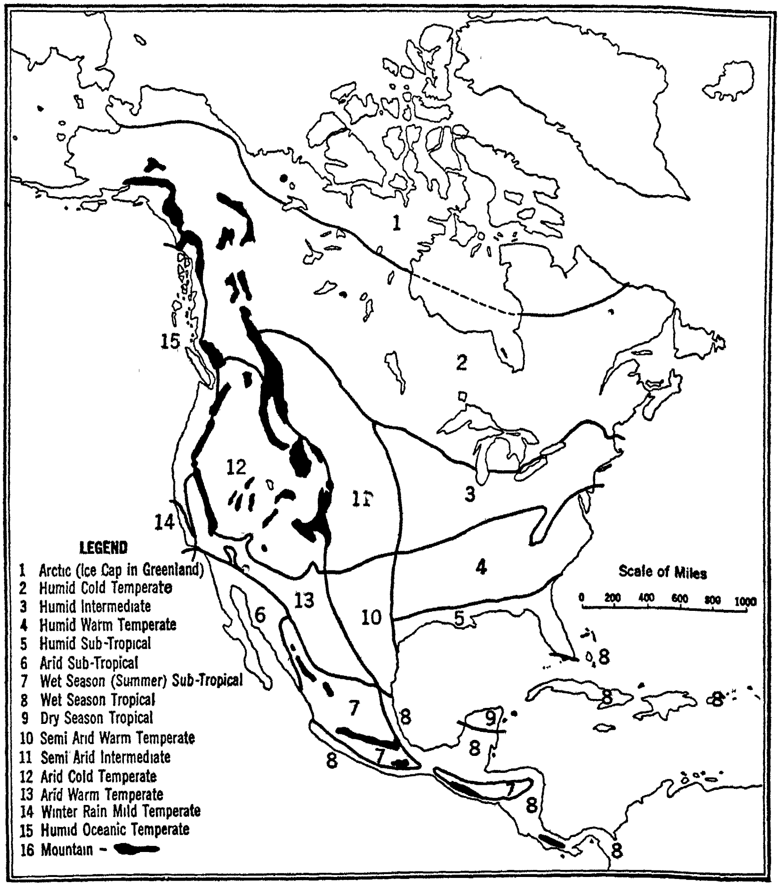


FIG. 13.—Climatic Regions of North America.

The boundaries of the regions are largely certain isohyets superimposed on the isothermal boundaries of the temperature regions.

Cold Winter temperature region that lies east of the 30-inch isohyet. The western border is adjusted to show the effect of a lower rate of evaporation in northern latitudes. Humid Warm Temperate and Humid Sub-tropical have the 30-inch isohyetal and the isothermal boundaries of temperature regions for boundaries. The Semi-arid Inter-

mediate and the Semi-arid Warm Temperate lie, in general, between the 15- and 30-inch isohyets. The 32° isotherm for the coldest month (January) separates these two regions. A small Arid Sub-tropical region in the valley of the lower Rio Grande is included in the Semi-arid Warm Temperate. The Wet-season Tropical region is the wet lowland area in the **Always Hot** temperature region.

EXERCISES AND PROBLEMS

1. Since so large a part of northern North America is ill suited, climatically, for man's activities, do you think the continent as a whole would be improved as a home for man did it occupy a position 20° farther south? On a base map of North America, reconstruct the temperature map, the surface features to remain as they are. On another base map indicate the probable distribution of rainfall for the year. Make a map showing the seasonal distribution of rainfall. Such maps must necessarily be " opinion maps " but the student has as much right to his opinion as others, provided he has good reasons for the opinion.

2. The *Statistical Abstract* gives normal temperatures for selected stations in the United States. Select ten or more widely distributed stations and, from a study of the data for these stations, determine in what temperature regions they are.

3. Data for normal monthly precipitation may be obtained from the same reference book. Select six or more stations in various parts of the country and construct graphs showing the seasonal distribution of rainfall.

CHAPTER III

THE UNITED STATES AS A NATIONAL UNIT

A Region and Its People.—People everywhere live in a given area or regional environment, and their opportunities depend upon (1) the size of the region, (2) the natural resources of the region, and (3) the number of people competing for participation in those resources. Such regions may be political, physiographic, geographic, natural, etc., and the opportunities offered may be few or many. Perhaps the cycle in which man modifies his environment in order that he may make the most of opportunities available, and environment modifies man in turn, *ad infinitum*, holds as a general principle. Possibly the operation of such a principle accounts for the present degree of social and intellectual attainment of the more advanced peoples. However, there are so many modifying factors, both within and without a given environment, that the general principle cannot be considered an immutable law. Certainly, what man does is influenced greatly by the environment in which he lives; but it is equally certain that not all racial stocks produce the same results in the same or in a similar environment. It is interesting to contemplate the results that would ensue if the German were substituted for the Russian or the Englishman for the Mexican. When people migrate to a new environment they take with them racial qualities that may have been acquired through centuries of racial experiences. These qualities are brought to bear upon the new environment and, in turn, may be altered considerably. It is probable that the American people are now undergoing such a change and that the qualities which may cause them to wield a beneficent or a malignant influence in future world affairs are now being evolved. Hence, the stage of human evolution—the human factor—must always be recognized in any geographical study.

Material Progress of a Nation.—For our purpose we are considering here a political unit—*a nation*—that stands as an individual entity among the nations of the world. It has been a land of abundance, of rapid growth in population, of rapid industrial development, and a land in which the stress of over-population, with the accompanying era of stringent economy and narrow margin between a comfortable living and poverty,

has not yet been felt seriously. It is this difference in well-being that has caused the flow of humanity from the older parts of the world to the

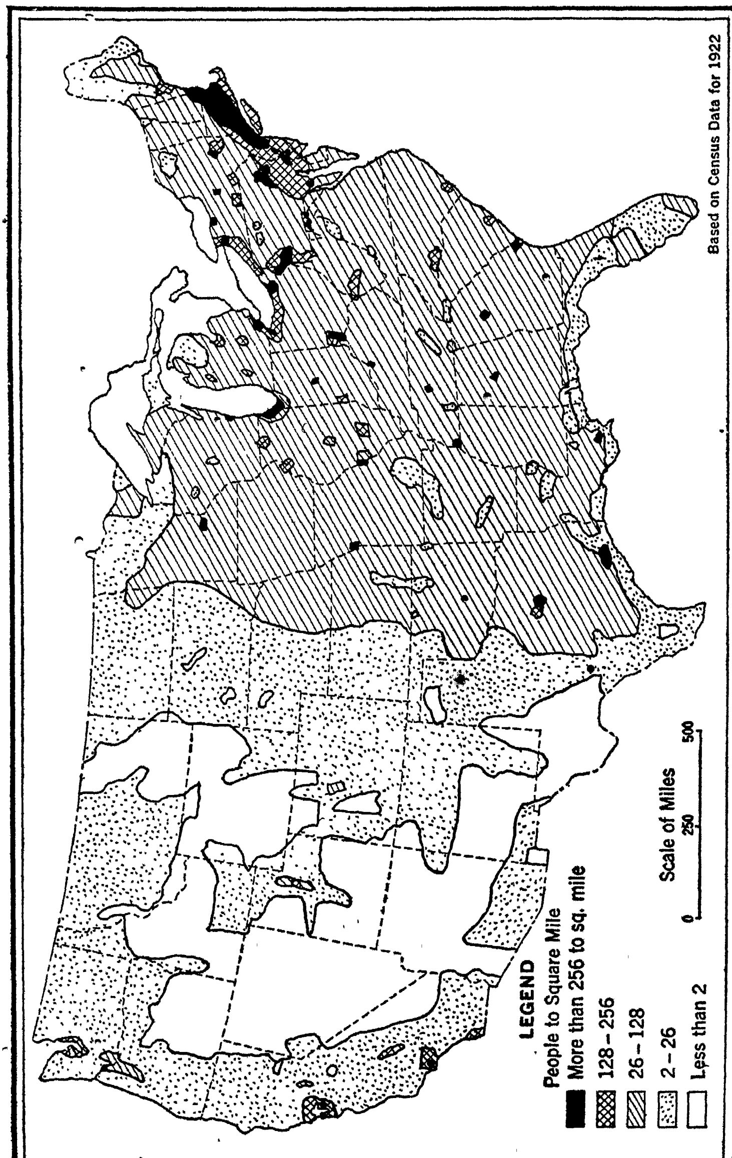


FIG. 14. Distribution of Population in the United States.

List the factors that account for the large number of people in the eastern half of the country. What is the principal reason for the sparse population in the Rocky Mountain and Plateau States? What proportion of the cities having a population of 100,000 or more are in the areas having 128 or more people to the square mile?

newer and chiefly to the United States. In a very short period of time the material progress of the nation has been phenomenal. Within its

bounds live only about 6 per cent of the world's population. However, of the world's production, that relatively small population produces two-fifths of the coal; nearly half of the iron ore; more than three-fifths of the pig iron; about four-fifths of the motor vehicles, more than two-thirds of the petroleum and Indian corn; more than half the copper, steel, cotton, and tobacco; and similar proportions of several other important products. Of the world's resources and material development, the United States has more than half of the coal reserves; a quarter of the iron reserves; nearly three-fifths of the telephone and telegraph mileage; more than a third of the railroad mileage, etc. It has become the leading nation in agriculture, mining, manufacturing, commerce, transportation, wealth, and standard of well-being of its people. Within a large, uncrowded, and richly endowed area, its people have made the greatest progress in material things.

Factors Favoring our Material Evolution.—What has made possible our great material progress in such a comparatively short time? Many factors—geographic, economic, racial, political—have influenced our growth, chief of which are the following:

1. An area of more than three million square miles. An area which is larger than Australia and about four-fifths as large as all Europe with its multitudinous nations each struggling with its environment and with other countries to attain greater opportunities for its people.

2. Great variety of climates, ranging from tropical to cold winters and hot summers, from winter rains to well-distributed summer rains, from aridity to excessive rainfall, from weather uniformity to frequent changes, from long to short growing seasons, and on the whole, healthful and invigorating over most of the country.

3. Extensive area of varied soils of high average fertility.

4. Large proportion of lowland plains accessible to the coast; the lesser mountain range on the Atlantic side; few isolated physiographic regions, a condition favoring unity.

5. Abundant, accessible minerals of high quality, especially the more important ones, such as coal, iron, copper, and petroleum.

6. Abundant forests of the most useful types of wood.

7. Long sea coast with numerous good harbors readily accessible to the rich hinterland.

8. Its location in the northern mid-latitudes across the narrowest major ocean from the progressive nations of Europe. It occupies the choice section of the North American continent.

9. A population derived chiefly from the north European racial stock, which is noted for its initiative, energy, and intelligence, and which has contributed most to the welfare of the world.

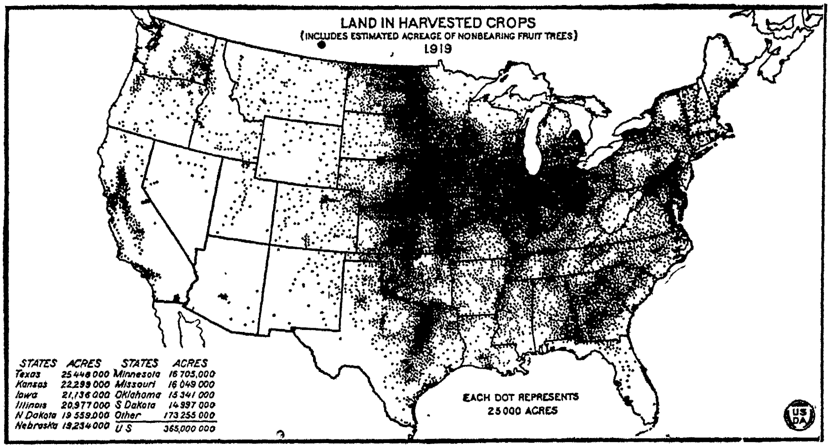
10. A strong, stable government which has fostered and protected individual initiative, general education, and scientific research; aided in industrial development; and protected from invasion.

The Present and Future.—To-day everything appears to be in the superlative. Here live a people under conditions that are far superior to those of any other like area of the earth. As previously stated, the material environment provided opportunities which enabled a capable people, in a short period of time, to attain a high stage of prosperity and evolve a nation that ranks among the first. Our past history is largely a record of man's exploitation of superb natural resources. Static conditions, or relatively permanent adjustment, have not yet been attained in any of our activities. The process of human evolution, by which man finally makes the most complete use of the natural assets of his environment, is still in progress. Absolutely permanent adjustment, of course, will never occur with a progressive people. We are still a people profiting chiefly by using the superabundant natural gifts of the most richly endowed political unit of the world. The future alone can record whether our country wields as great an influence in the world and makes as great contributions to the advancement of human welfare as have the countries of Europe. Though material resources that assure opportunities for maintaining high standards still exist, the day of free land—" Uncle Sam is rich enough to give us all a farm "—has gone. Our forests are being depleted rapidly, our mineral production is on a huge scale, and our population is increasing at a high rate though our recent immigration laws have checked the growth. It is the principal purpose of this chapter to provide an over-view of our land as a nation by considering some of the major aspects of its development and some of the opportunities available to future generations; and, perhaps, to awaken an appreciation of the land we call " Our Own United States."

UTILIZING THE LAND

As stated in Chapter I, the land is the most important natural resource that man possesses. It was man's desire for new lands, with the greater opportunities for human well-being, that brought European settlers to our shores. The first settlers were confronted by a broad expanse of forest-covered terrain much of which provided poor soils when the forests were cleared away. Production of food under those pioneer conditions was a strenuous task, and even the optimum reward must have been discouraging. Later the tide of migrating man swept on westward to the vast, gently rolling, grassland plains. At first he ignored them, as the experience of his race had implanted in him the idea that crops could

be produced only on forest land—on land which produced only grass, never! When this erroneous idea was finally abandoned settlement spread rapidly over the fertile, level prairies of the interior; and some of the more hardy souls pressed ever onward to the far Pacific, lured there at first by the gold but later to cultivate, to irrigate, to mine, and to harvest the products of the forest and of the sea. Thus, from the primitive agriculture of the early New England farmer on his boulder-strewn and forest-bordered clearing to the far-flung expanse of field on field that now spreads out across the interior plains, and on to the Pacific, has



From Agricultural Yearbook, 1921, p 424.

Fig. 15.

More than five-sixths of the land in crops is in the eastern humid half of the country, and nearly two-thirds is in the triangular-shaped area extending from eastern Ohio to north-central North Dakota and central Texas. This triangular region includes only about a quarter of the area of the country yet it produces three-fifths of the hay, four-fifths of the corn, and three-fourths of the wheat and oats. No other similar area of the world offers equally favorable conditions for corn culture, and it is probable that few, if any, other regions are as suitable for the production of small grains and hay.

gone man in his effort to produce more and still more. To-day those lands, pioneered but a few years ago, are being utilized on a scale never before approximated in the history of the world; yet an *intensive* utilization has nowhere been reached.

Importance of Agriculture.—Agriculture is man's most important industry. It provides for his fundamental needs. The nation that can feed, clothe, and shelter its people in comfort is as nearly independent as a nation may become. However, man *wants* far more than his mere necessities. To supply his *wants,* he produces for others and builds up a complex system of interchange of products. Many of our largest manufacturing industries, especially those of food and clothing, depend quite

as much upon the producer of crops as upon the financier who provides the capital, the miner who supplies coal for power, or the captains of transportation who carry the raw materials and the finished goods. In fact, most of the commercial and industrial prosperity of America is rooted in the land.

Agricultural production in the United States now exceeds that of any other country and is a tenth larger than that of the whole British Commonwealth. The value of the agricultural products of the Russian Empire (before the World War) was about two-thirds that of the United States; that of China is two-thirds to three-fourths; and that of India less than a half. The production of all other countries is small in comparison. The United States is also the leading exporter of agricultural products. The value of its exports since the War has been larger than that of all other countries combined, yet those exports were only an eighth of its production. Of the world's aggregate crop production it now produces about 70 per cent of the corn, 52 per cent of the cotton, 50 per cent of the tobacco, 25 per cent of the oats and hay, 20 per cent of the wheat and flaxseed, 13 per cent of the barley, 7 per cent of the potatoes, 5 per cent of the sugar, and 2 per cent of the rye and rice.[1] Taking cereals alone, it produces about a quarter of the world's total crop. Yet American agriculture is only just showing a tendency toward that stage of "settled maturity" characteristic of the Old World. (See Curve of Population Growth, Chapter I.)

AGRICULTURAL REGIONS

It is axiomatic that not all land is equally suited to the raising of the same crop. In an area as large as that of the United States and located in mid-latitude, divergence in agricultural and pastoral industries is to be expected. Many factors determine the differences that now exist or may develop in such a large area. Among the more important geographic factors are (1) climatic differences, (2) varying proximity to markets, (3) topographic differences, and (4) differences in the chemical and physical characteristics of the soil. The influence of the last factor is most striking in small areas such as a township or county, and the influence of the others in larger areas.

The East *vs.* the West.—In general, the United States is divided about equally into an eastern humid half, characterized by the cultivation of grains, tame hay and pasture, and the production of shelter-fed livestock; and an arid or semi-arid western half, characterized by wild hay, pasture and grazing, irrigation, dry farming, and very limited

[1] O. E. Baker, Agriculture Yearbook, 1921, p. 407.

Courtesy O. E. Baker and Economic Geography.

FIG. 16.

The United States is divided into a humid eastern half and an arid or semi-arid western half except the higher mountain elevations and the North Pacific coast. Each subdivision or region is characterized by a distinctive crop system or crop combination due primarily to climatic differences. In the humid East these regions have been determined by a leading crop except the Subtropical Coast where climate and low wet lands are determinants. In the drier West the names reflect the strong climatic influence of topography and of the Pacific Ocean.

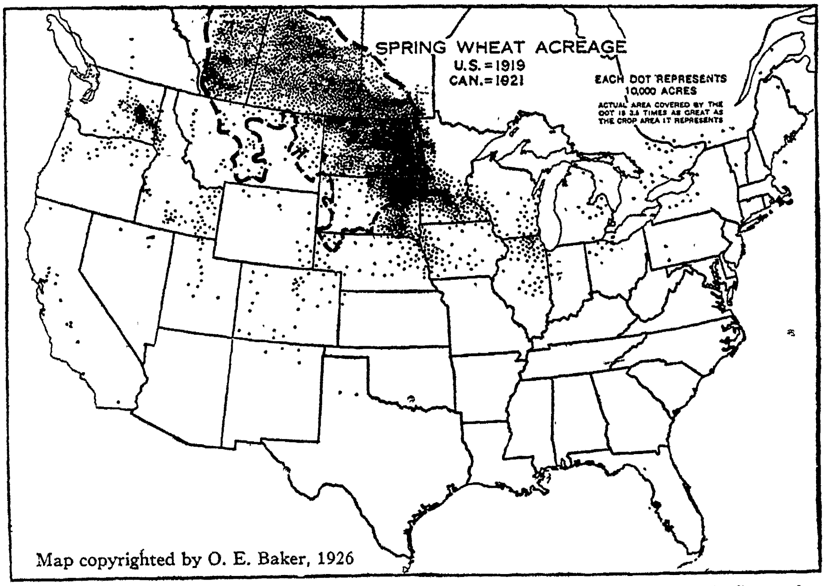
humid-type agriculture. Local sections in California, the North Pacific Coast and the northern Rocky Mountains are exceptions, but they are relatively small. The transition belt between the eastern and western halves corresponds approximately to the 100th meridian of West Longitude and to an average annual rainfall of 25 inches in southern Texas and 15 inches along the Dakota–Canadian border. The agricultural regions in the eastern humid half extend, in the main, east and west corresponding closely to latitude, and are determined chiefly by temperature and the leading crop. Those of the western arid and semi-arid half extend north and south and are based primarily upon the rainfall and topography. The eastern humid half produces fully 85 per cent of the total value of all crops and has a like proportion of the crop acreage. In the East "corn is king," and in the West hay is the leading crop, though forage secured by grazing nearly equals it in value. In the former, 25 per cent of the crop acreage is devoted to corn and its value is nearly 30 per cent of the total value of all crops, while in the latter the percentages are 37 and 26 respectively.

The Arid and Semi-arid West.—This extensive area of scant precipitation is a land of high mountains and plateaus and has an average elevation of more than 4000 feet, hence altitude and rainfall are the principal factors determining its sub-division into agricultural regions. Except in the humid North Pacific Region, and in the irrigated and dry-farming sections, 2000–4000 acres are needed to support a family. In the irrigated section 80–120 acres are required, and in the dry-farming sections 320–640 acres. The total value of all the crops of this area forms only about 15 per cent of the total for the United States. The character of the present agriculture is shown by the fact that hay constitutes approximately 26 per cent of the value of the crops; wheat, 21 per cent; fruit and nuts, 18 per cent; vegetables, 8 per cent; and oats and barley, 6 per cent. More than three-fifths of the crop acreage is in the Great Plains Regions of dry-farming and grazing.

The scant rainfall throughout nearly the whole area limits most of it to the grazing industry. Sheep are raised in the more arid, and cattle in the less arid sections. Here are produced more than half of the sheep of the United States and more than a quarter of the cattle. In the cool, moist North Pacific Region, dairying is the most important live stock industry. In the vast mountain and plateau country between the North Pacific Coast and the Great Plains, grazing is likely to remain the leading activity. Much of the region provides only scanty pasturage as it is so dry that 50–100 or more acres are required to maintain one steer. Crop production on an intensive scale is impossible except by irrigation, and only a very small fraction of this area can ever be irrigated because

of insufficient water. Approximately 30,000 square miles are now irrigated in the entire West, and more than half of this area is in California, Colorado and Idaho.

Dry-farming appears to offer limited possibilities in competition with the humid East. At the most, it is an effort to make the best of an unfavorable climate. It consists essentially of cultivating semi-arid lands in such a manner as to accumulate and conserve the moisture received during one or more years, and taking a chance that there will be



Courtesy O. E. Baker and Economic Geography.

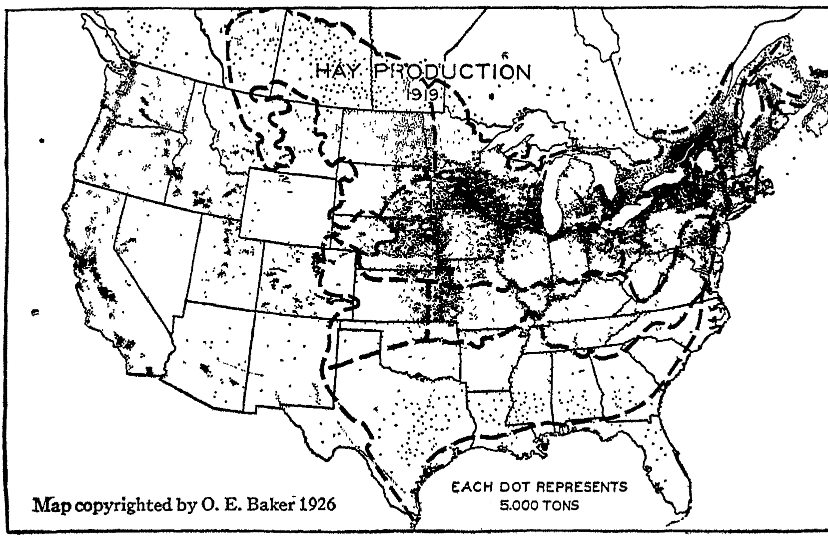
FIG. 17.

About half the spring wheat acreage of the United States is in the Spring Wheat Area, where two-fifths of the crop acreage is devoted to its culture, and most of the remainder is in the adjoining Great Plains Region. Nearly nine-tenths of the total crop of North America is produced in the Canadian and United States sections of this area. A lesser but important producing center is located in the subhumid sections of Washington and Oregon.

sufficient moisture to produce a crop once in two or three years. If conditions prove favorable, profit may result, as the land is relatively cheap and the investment small. Thus far, it has proven disappointing in the solution of dry-land problems, and as a means of providing for a large agricultural population it is not promising.

The Spring-wheat Region.—This nearly flat to gently rolling area with fertile black soils, within which lies the famous Red River Valley, is characterized (1) by spring-grown cereals—wheat, oats, barley, flax—with wheat as the dominant grain, and (2) by an extensive type of

agriculture. Most of its products are shipped to distant markets and very little is consumed on the farm where grown. Live stock and cultivated hays are relatively unimportant, though corn for forage and the dairy industry are now entering the region. Fields of corn may now be seen in the northern stronghold of spring wheat. The potato is another crop rapidly growing in favor and competing with spring-grown cereals. Practically no spring wheat is grown outside this area, and its crop constitutes more than 30 per cent of the total wheat crop of the United States. More than four-fifths of the area is in farms; nearly seven-



Courtesy O. E. Baker and Economic Geography.

FIG. 18.

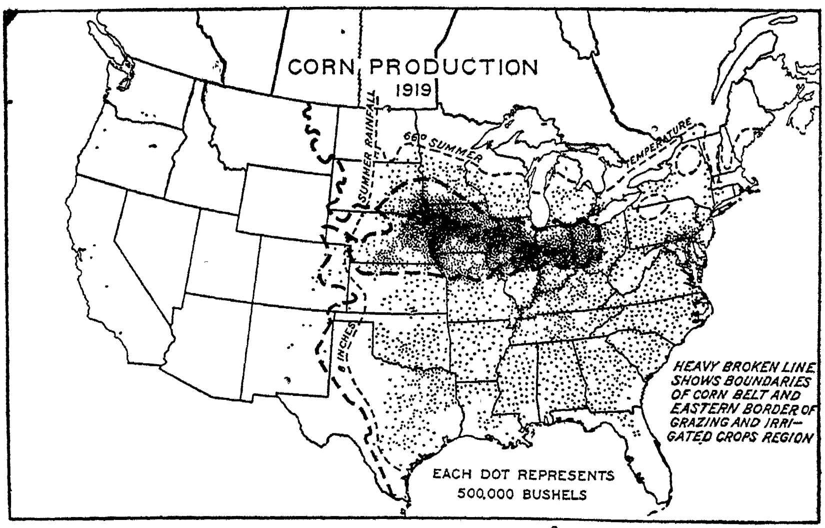
Hay and forage acreage is concentrated chiefly in the Hay and Dairying Region (Fig 16) and around the margin of the Corn Belt. In the drier Rocky Mountain Region, where mixed farming is limited by scant rainfall, hay and forage occupies 55 per cent of the crop land.

tenths is improved, and more than half is in crops. The (1) low rainfall of 15–25 inches coming chiefly in the spring and summer, (2) long, cold winters of comparative idleness, (3) short, hot summers favorable to ripening and harvesting of grains, (4) fertile prairie soils, and (5) the distant consuming markets have been the principal factors in evolving the distinguishing type of agriculture in this region.

The Hay and Dairying Region.—This northern region extending from Minnesota to Maine, with its cool, moist summers, its poorly drained glacial soils and many swamps, and its relatively large proportion of rough lands, is preëminently a land of hay and pasturage. Half or more of the improved land in nearly every county of the region

produces these crops. Less than a third (31 per cent) of the area is improved, and only about a fifth (22.6 per cent) is devoted to crops. The large production of hay and the excellent pasturage are the bases for a well-developed dairy industry which finds a ready market for its milk, butter, and cheese in the scores of large cities within or adjacent to the region. Other crops, such as fruits, sugar beets, potatoes, beans, corn, and small grains, occupy a leading position in local districts but are relatively small factors in the agricultural economy of the region as a whole.

On the northern margin is an extensive deforested area, parts of which are suited to agriculture and are being settled slowly. However,



Courtesy O. E. Baker and Economic Geography.

FIG. 19.

South of the line of 66° mean summer temperature and east of the line of 8 inches mean summer rainfall is located nearly two-thirds of the corn acreage of the world. It is the dominant crop in the Corn Belt, occupying about two-fifths of the crop acreage and contributing half the total crop value. Hay, spring oats, and wheat are its other important crops.

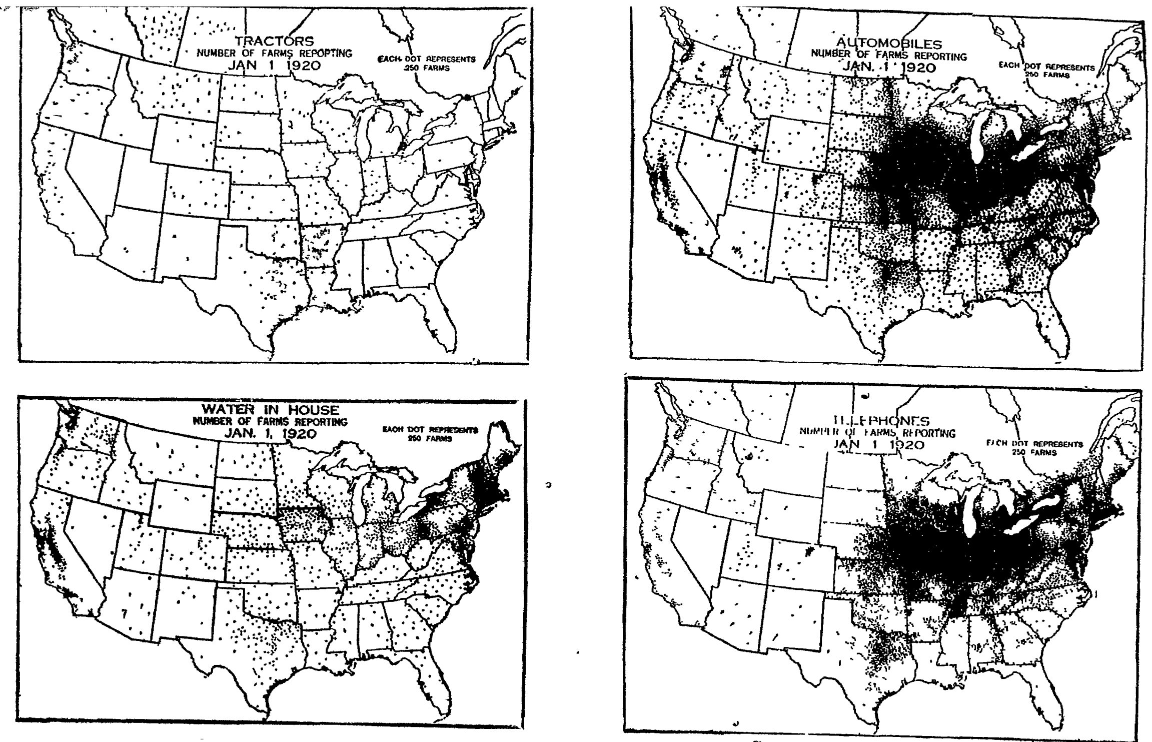
much of this section is best suited to the growth of forests and should be used for that purpose.

The Corn Belt.—The Corn Belt probably produces more food to the square mile than any other area of like extent in the world. More than nine-tenths of its area is in farms, more than three-fourths is improved, and more than three-fifths is in crops. The warm, moist climate, and rich soils make the region peculiarly well adapted to corn and associated meat production. Nearly two-fifths of the crop acreage

is devoted to that cereal, and the annual crop contributes half the value of all crops. More than half the corn crop of the United States is produced in this region, and it is also the center of the beef-cattle and hog-raising industries, where about a quarter of the former and more than two-fifths of the latter are produced or gotten ready for market. Other important crops are hay, oats, and wheat, which provide a desirable system of rotation—hay and oats along the northern margin and hay and wheat along the southern. Abundant spring and summer rains, a long, warm growing season, and great extent of exceedingly rich silt loams, spread over a level or gently undulating plain, are the basal geographic factors that have contributed toward making the Corn Belt a superior agricultural region. The stage of general prosperity and progress of its farming people is indicated by the widespread use of modern conveniences such as the automobile and telephone. From 60–90 per cent of the farms have telephones; from one-half to three-fourths of the farms have automobiles; and two-fifths of the total number of automobiles on farms in the United States are in the Corn Belt. A similar ratio holds in the use of modern farm machinery. (Figs. 20–23.)

Corn and Winter-wheat Belt.—On the south the Corn Belt blends into the Corn and Winter-wheat Belt and the Hard Winter-wheat Region with no sharp line of demarcation. The three regions have more than seven-tenths of the winter-wheat acreage of the United States, 42 per cent being in the second and third. The northern limit of this crop corresponds in general with the mean winter isotherm of 20°, and its southern limit with the mean isotherm of 72° for the month just before harvest. Though winter wheat occupies about 30 per cent of the crop acreage in the Corn and Winter-wheat Belt, corn exceeds it in value. Cattle and hogs are also produced in large numbers, but they are relatively less important than in the Corn Belt.

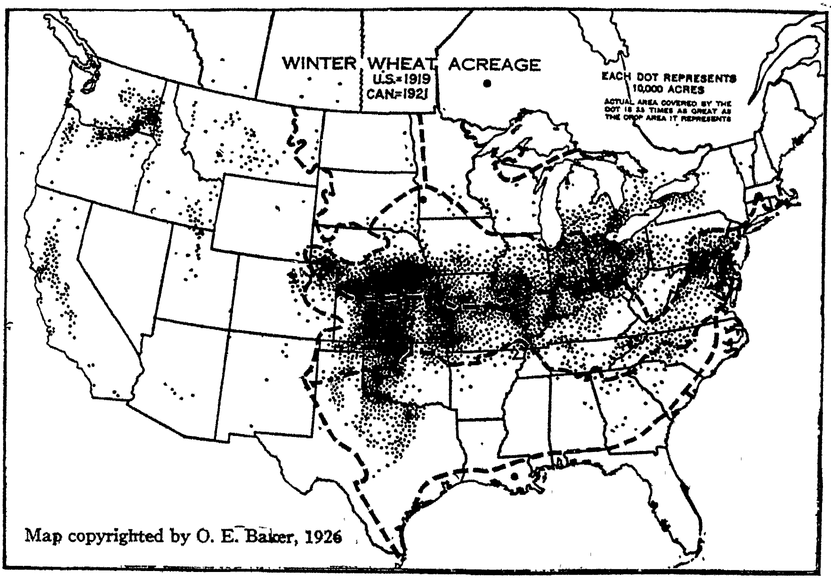
The Cotton Belt.—Cotton is king of crops in the Cotton Belt, and corn is the leading cereal. Forty-four per cent of the cropped land is devoted to cotton culture—this is a region where only about a fourth of the entire area produces cultivated crops of any kind. Unlike corn, cotton is distinctly a cash crop, and all except part of the seed leaves the farm upon which it is grown. Prosperity, therefore, soars or wanes with the price of cotton and size of the crop. Very little cotton is grown in the United States outside of this belt. Its northern limit is 200 frost-free days and a mean annual temperature of 77°; the southern limit is 11 inches of autumn rainfall, as more than that amount injures the lint and seriously interferes with picking. Scant rainfall limits cotton growth on the west, except by irrigation. Cotton is grown on all well-drained types of soil; but the larger crops are produced in normal years



FIGS. 20, 21, 22, 23. *Courtesy O. E. Baker and Economic Geography.*

The distribution of tractors, automobiles, and telephones on farms reflects the tendency of the American farmer to utilize modern mechanical equipment, and the degree of rural progress and prosperity attained in various sections of the country. Tractors are used most extensively in the corn and wheat regions. However, the Cotton Belt farmer is limited by the acreage he can pick rather than by the number of acres he can plant and cultivate, hence tractors are of small use to him compared with the corn and wheat farmer. Two-fifths of the automobiles on farms in 1920 were in the Corn Belt where 60 to 90 per cent of the farms had telephones. A modern water system in the farm home reflects the consideration shown the farmer's wife, the degree of tenancy, and the per capita rural wealth. Only in New England and California are half the farms so equipped. In New York, Pennsylvania, Oregon and Washington the ratio is 1 to 4, in the Corn Belt 1 to 8, and in the Cotton Belt about 1 farm in 50 to 100.

upon the dark-colored clay lands, especially those rich in lime, and upon the red, brown, and black bottom lands. Both the climate and the soil of the Cotton Belt are particularly well suited to the growth of cotton and are the principal geographic factors that have made this the world's largest cotton region, and cotton our largest commercial crop and largest export commodity. Other factors favoring its extensive culture are (1) a large world demand and limited areas favorable to its culture, (2) the fact that cotton growing provides employment from early spring to



Courtesy O. E. Baker and Economic Geography.

FIG. 24.

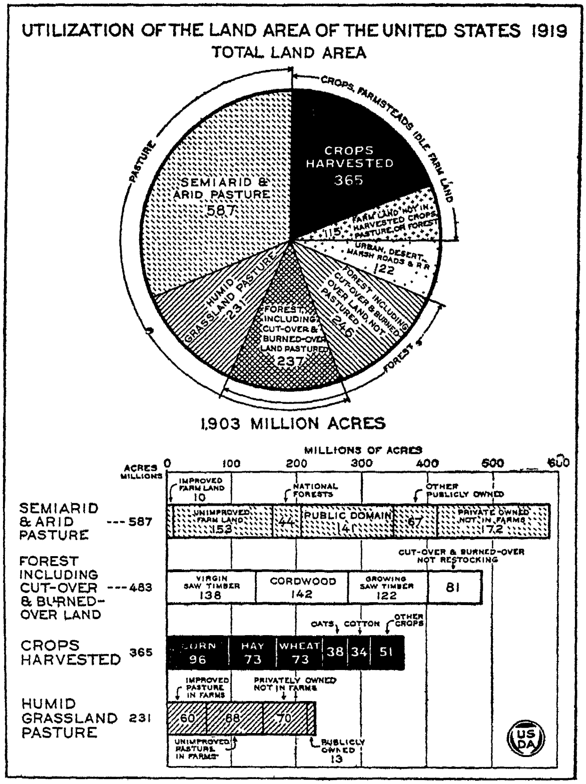
About four-fifths of the winter wheat is grown in the Hard Winter Wheat Region, the Corn and Winter Wheat Belt and the Corn Belt. The southern boundary follows closely the isotherm of 72° for the month preceding harvest (June 15). Wheat grown south of this line is subject to severe damage from rust. The northern boundary follows, in general, the mean winter isotherm of 20°.

early winter, and (3) the fact that the crop is sold directly for cash instead of indirectly through live stock as is corn. (Fig. 153.)

Sub-tropical Coast.—This hot, moist coastal lowland region extends from South Carolina to Texas. The warm winds from the warm Gulf and oceanic waters exercise a controlling influence on its climate and agriculture. It is characterized by a sub-tropical climate, sandy soils, and extensive areas of poorly drained land, rather than by any leading product. Agriculture is sub-tropical in character and varies from rice, sugar cane, winter vegetables, and citrus fruits, to cattle ranching. Only

five-sixths of the crop acreage is located, the north central section is by far the most important. (Fig. 15.) The triangular section lying between north central North Dakota, central Texas, and eastern Ohio contains nearly two-thirds of the cropped land, and though it embraces only about a quarter of the United States produces four-fifths of the corn, three-fourths of the wheat and oats, and three-fifths of the hay. Cotton is the only other important crop produced outside of this section. Its geographic advantages for the growth of small grains and hay are equaled by few other parts of the world, and it is superior to any other equal area for the production of corn.

Corn, hay and forage, cotton, wheat, and oats are the five principal crops of the United States. (Fig. 25.) These crops occupy about nine-tenths of the acreage and constitute more than three-fourths of the value of all crops produced. They also constitute a large proportion of the world's production.



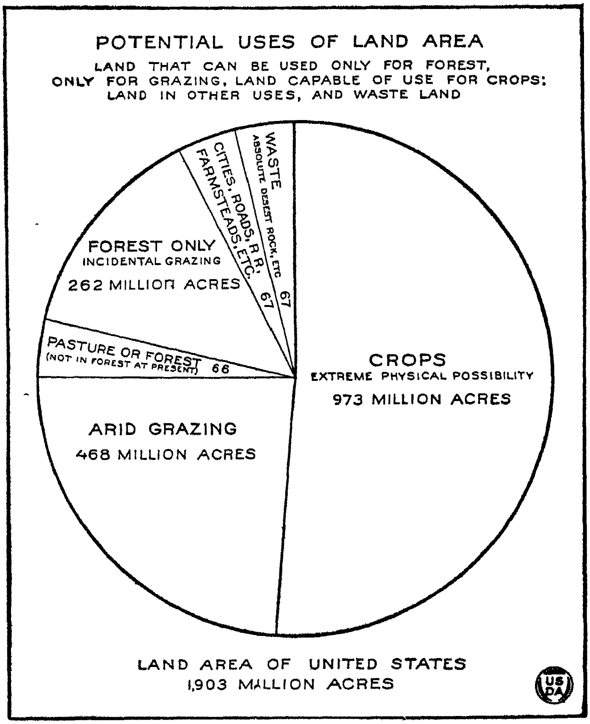
Courtesy U. S. Department of Agriculture.

FIG. 29.

Nineteen per cent of the total land area of the United States in 1919 was occupied by harvested crops, 43 per cent by pasture, and about 25 per cent by forest and cut-over lands. However, the product-value derived from the relatively small area of crop land was far greater than that derived from the large area of pasture and forest.

Live Stock.—The production of live stock is a major phase of American agriculture. About seven-tenths of the crop acreage produces food for domestic animals, and, in addition, 231 million acres of improved and unimproved humid grassland, 237 million acres of forest and cut-over

lands, and some 587 million acres of arid and semi-arid land are used for this purpose. Domestic animals consume essentially all the feed produced on unimproved land, two-thirds of that on improved land, and fully four-fifths of all that produced by wild and tame vegetation in the country. Nearly seven-tenths (69 per cent) of the land area of the United States is utilized for the production of forage. The humid East produces most of the food and most of the cattle and hogs, while the drier lands of the West produce most of the sheep. Cattle are more evenly distributed than either hogs or sheep; being most abundant in the Corn Belt, the Hay and Pasture Region, and the Corn and Winter-wheat Belt. Hogs are intimately associated with the production of abundant fattening food, hence two-fifths are in the Corn Belt and another fifth in the Corn and Winter-wheat Belt. Sheep are better adapted to the rougher and more arid lands than are other domestic animals; they can go for days or even weeks without water when the pasture is succulent; they can be handled in large bands owing to their herding instinct; and hence three-fifths are raised in the western half of the United States. (Figs. 26, 27, 28, 114.)



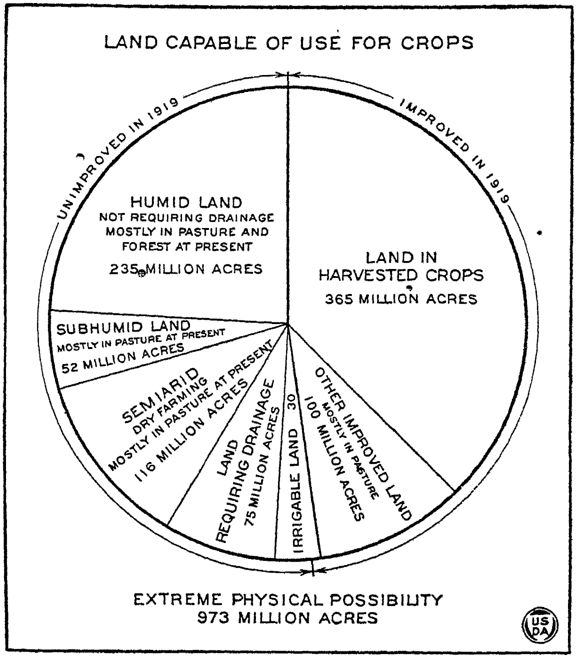
Courtesy U. S. Department of Agriculture.

FIG. 30.

Physically 51 per cent of our land area is suitable for crops, nearly 25 per cent for grazing only, and 13 per cent is best suited to forests. Compare with Figs. 29 and 31.

Potential Agricultural Area and Population.—How to provide food that is adequate both in quantity and quality to meet the needs of an increasing population is one of the serious problems confronting every

nation that endures during any extended period. Many nations must turn to an outside source of food supply; a few have an abundance of potentially productive lands within their borders. The chief agricultural uses that any nation makes of its land are for crops, pasture, and forest. At the last census (1919), about a fifth of the land area of our country produced harvested crops; about two-fifths (43 per cent) produced pasture; and a quarter was occupied by forest and cut-over land. (Fig. 29.) However, the value of the harvested crops produced on the one-fifth so used was immensely greater than the value produced on the two-thirds devoted to pasture and forest. For many years we met our food requirements for consumption and export by bringing new land under cultivation. The peak of agricultural land supply in proportion to population was passed about thirty-five years ago, and the future will show a continually increasing scarcity of such land. Nearly all our land suitable for crops, pasture, or forest has long since been appropriated, hence an increase in food supply must come either (1) from increased yield per acre, or (2) at the expense of pasture and forest area. It seems certain that both means may be utilized to advantage.



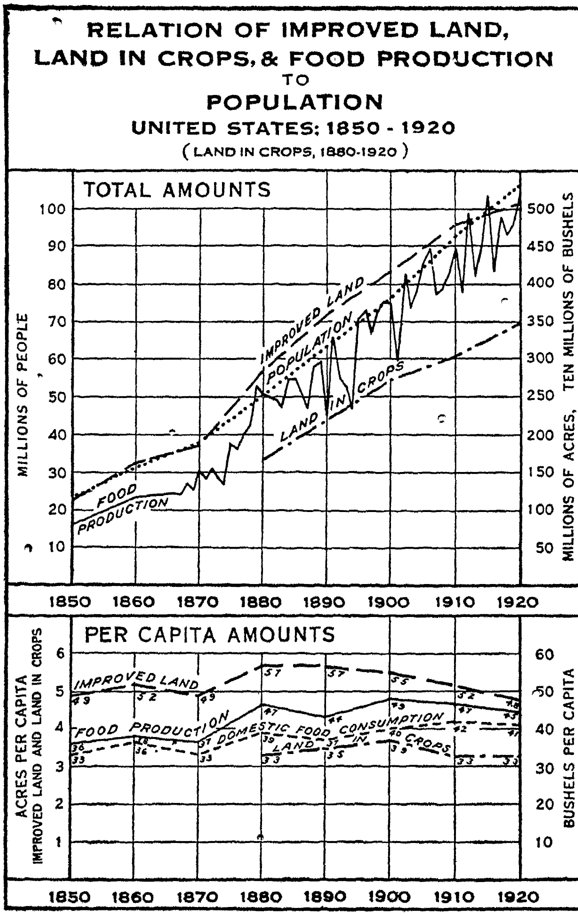
Courtesy U S. Department of Agriculture.

FIG. 31.

It is estimated that about 600,000,000 acres are physically capable of crop production in addition to the land so utilized at present. However, it is likely to be many generations—if ever—before it will be economical to produce crops on all the land physically suitable. Yet the estimate is an approximate measure of our resources.

The United States has about 973 million acres physically capable of producing crops, 365 million of which are now used. (Fig. 31.) It is, however, idle to assume that the maximum will ever be so used or, at

least, until the need is extreme and cost of utilization is of little consideration. Such figures have value only as indicators of maximum potentiality. It has been estimated that a population of 150,000,000 can be cared for without seriously altering our standard of living, by adding 40,000,000 acres to our cropped land and improved pasture. Beyond that number of people, both our standard of living and crop yield per acre must be materially altered. If we increase our acre-yield until it equals that of western Europe, and accept the pre-war German standard of living, we can provide for about 300,000,000 people. It is likely that for many decades the reality will be between these two population estimates, as standards of living and acre-yield slowly change.



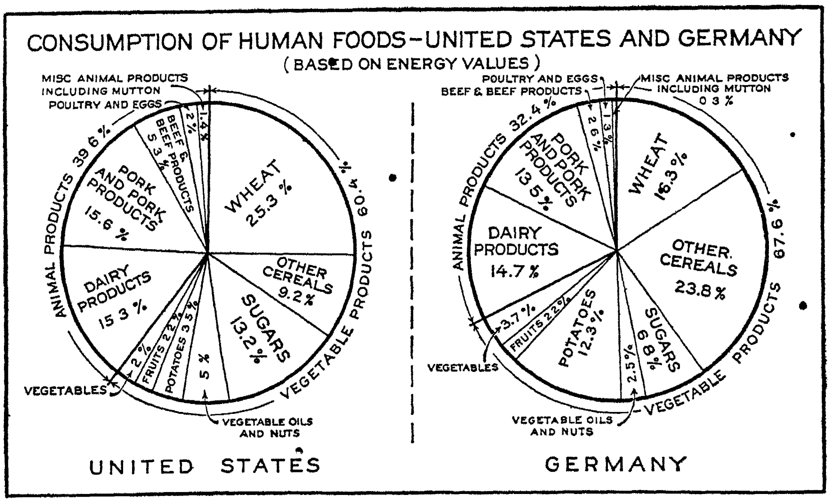
From Agricultural Year Book, 1921.

FIG. 32.

The amount of improved land kept pace with the increasing population from 1850 to 1870, increased more rapidly than population till about 1885, then more slowly till 1910, and during the decade 1910–1920 increased only 5 per cent, as compared with 15 per cent increase in population. Food production, however, increased more rapidly than population till about 1906, or for 20 years after the peak had been reached of acreage of improved land per capita, and has since increased more slowly than population. But consumption per capita has been maintained up to the present time by diminishing the exports.

However, these estimates assure us that our country has the land resources capable of maintaining a considerably larger population than we

now have, on a living level far above that of western Europe. Our country possesses agricultural advantages both geographic and non-geographic, that are superior to those of any other nation. Among these are (1) great extent of highly fertile and varied soils on nearly level or gently rolling plains, (2) varied and highly favorable agricultural climate over the fertile plains, (3) a healthful and stimulating climate, (4) an excellent transportation system, (5) excellent home markets and accessibility to foreign markets, especially those across the narrow Atlantic in western Europe, (6) a highly developed system of agricultural education and



Courtesy U. S. Department of Agriculture.

FIG. 33.

The German diet (before the War) consists of a higher percentage of cereals and potatoes than does that of the United States. However, our wheat consumption forms a larger proportion of the total than in Germany. There is little difference between the two countries in the consumption of pork and dairy products but we use considerably more beef and sugar. This indicates the character of the dietary changes that we must make if we are to maintain a population of 300,000,000.

Government aid, both State and National, and (7) a strong, stable government.

OUR MINERALS AND POWER

Next to the products of the soil, modern, complex, human life—called " civilization "—depends for its material success upon the application of mechanical power to machinery. This requires minerals—coal, water, oil, gas, iron, copper, and others. With the exception of potash and tin, the United States has all the important minerals in abundance

and of high quality. It also has potash, but not of sufficiently high quality to make its production profitable at present.[2] Its tin resources are insignificant. Only a few minerals are of such vital significance to us that they need be considered here.

Iron.—Of all mineral derivatives, iron may be considered the indispensable one, though its use is well-nigh inseparable from that of coal, which is needed for its production and as power to drive the machinery made from it. Our iron ore deposits are both widespread and of high quality compared with much of the iron ore that is used in western Europe. (Figs. 34, 131.) It is fortunate, indeed, that our best and most cheaply mined ore is tributary to the Great Lakes, over which it may be transported, at low cost, to those centers in the central and eastern states where the presence of good coal fosters manufacturing and the development of great consuming markets. Within our borders is located more than a quarter of the known metallic iron of the world, and we have sufficient coking coal with which to smelt it. Though the higher-grade ores would be exhausted within a generation were it possible to maintain the present rate of production, the vast amount of lower-grade ore assures us of a supply ample to our needs for an indefinite time.

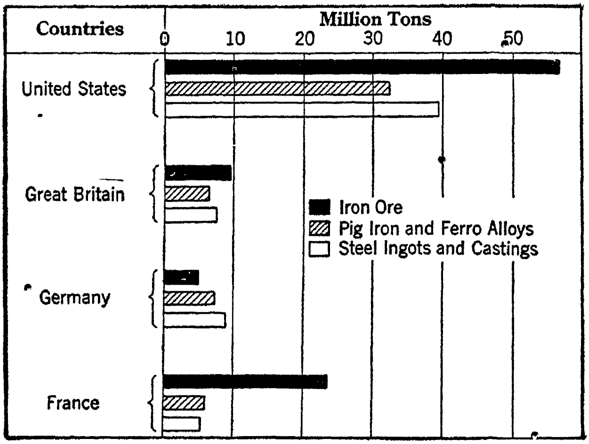


FIG. 34.—Iron Ore, Pig Iron, and Steel Production by Leading Countries. Average, 1922–1924.

The United States is, by far, the largest producer of iron and steel, its annual output being more than two-fifths larger than that of Great Britain, Germany and France combined.

The production of iron and steel is often spoken of as a barometer of industrial prosperity and an index of the stage of modern material development, because of their basal importance in the activities of "civilized" man. On this basis the United States should rank high, as it mines and consumes more than two-fifths of the world's output of iron ore; more than three-fifths of the world's pig iron and more than half the steel;

[2] Preliminary reports of investigations now in progress indicate that commercial production may be possible.

and its average annual production of these products is more than 50 per cent greater than the combined output of the next three leading

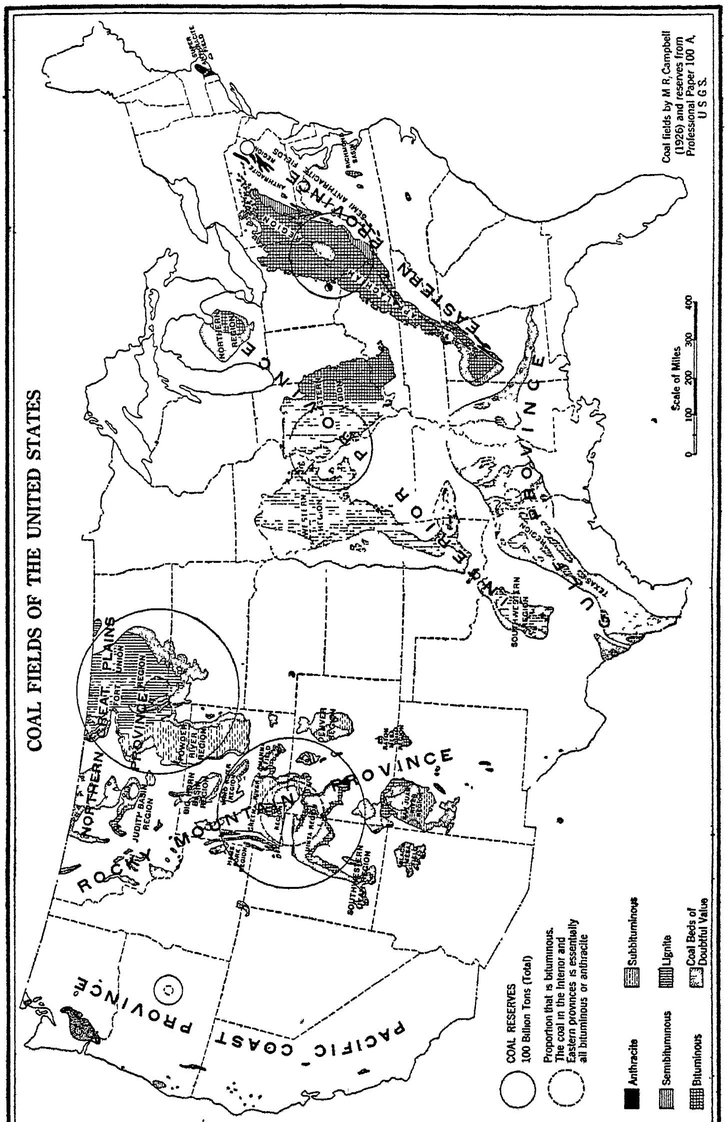


FIG. 35.

Coal is well distributed throughout the country and is our chief source of energy. Nearly all the high grade coal is east of the Mississippi where more than nine-tenths of the total annual output is mined, and where it is of greatest usefulness. Our reserves are enormous, constituting more than half the known coal of the world.

nations. It is as nearly independent and self-sufficing as any nation can be, and is likely to remain so.

Coal.—Machine power makes possible the difference between modern and primitive man. It makes possible our cities, our railroads, our

manufacturing industries and extensive commerce, our great churches and schools, and much of our recreation and pleasure. In fact, our whole modern social and industrial fabric depends upon it. Experts have estimated that the annual production of machine power in the United States is equivalent to the service of thirty servants for every man, woman, and child. Coal is the dominant source of that power and hence is fundamental to our well-being, as it is impossible to imagine a social and economic system, such as that we now possess, depending upon the unaided labor of man. (Figs. 35–39.)

To meet our requirements we produce nearly two-fifths of the world's coal, an annual tonnage which is nearly twice that of any other country and greater than the combined output of Great Britain and Germany. (Fig. 39.) Measured in heat or power units, the ratio in our favor is very much greater, as a large proportion of European production is low grade. For the future we have more than half the known coal of the world. Nearly all our coal of high grade is east of the Mississippi River where it is of maximum usefulness and where more than nine-tenths of the annual output is now mined, chiefly in Pennsylvania, West Virginia, Illinois, and Kentucky. Even though the present rate of production is considerably increased, the supply is sufficient to last many centuries. The high-grade coals, however, will be gone in much less time if production is confined almost exclusively to them as at present.

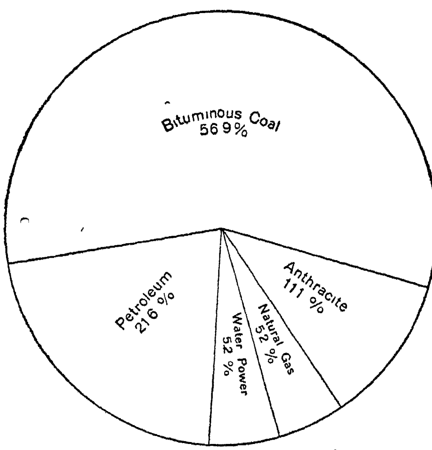


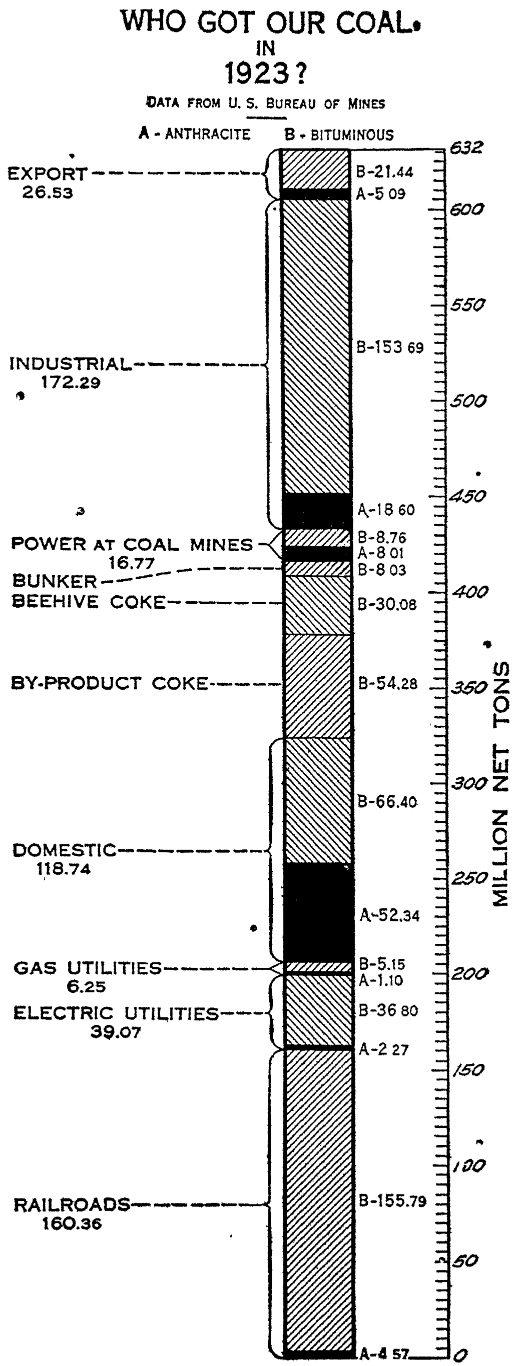
FIG. 36.—Energy Sources of the United States in 1924.

Coal is now the source of about 68 per cent of the mechanical energy produced in the United States annually. Petroleum and natural gas rank next with nearly 27 per cent. Will these ratios be maintained in the future? What changes are likely?

Water Power.—Water is the most permanent and constant source of power, as both coal and oil are exhaustible. Our present utilization is 11.7 million horse power, and our resource available, without storage, is calculated to be 30–50 million, the estimate varying with the length of the low-water period taken as the basis for computation. It is significant (1) that the larger amount probably would turn all the wheels of our present industries, and (2) that three-fifths is in the Pacific States,

Idaho and Montana, which are poorly endowed with good coal for their industries and railways. However, these resources undoubtedly would be of greater value to our country if a larger proportion were located east of the Mississippi. It is clear that our coal and water assets provide us with power adequate for all future needs. (Fig. 40.)

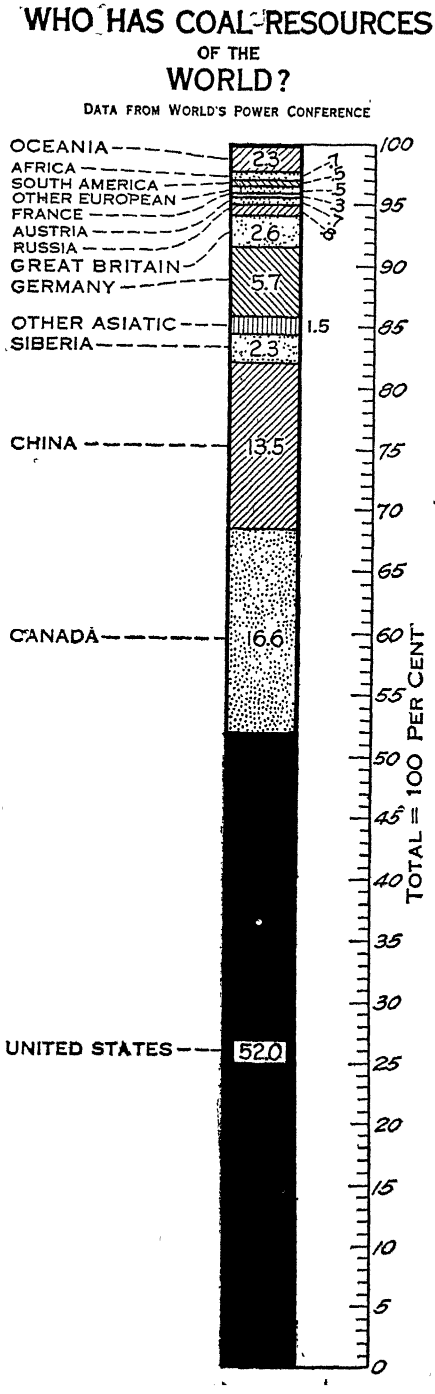
Petroleum. — Within but a few decades, petroleum has become a commercial necessity. It serves us chiefly as a source of power, light, and lubricants, though the refined products derived from it are almost countless. It is even conceivable that future national leadership in the air and on the sea may be determined by the possession of fuel oil, kerosene, gasoline, and lubricating oil, since their efficiency for navigation purposes is greatly in excess of that of coal or its products. (Figs. 41, 42.)



Courtesy Samuel S. Wyer.

FIG. 37.

About 40 per cent of the annual output of coal is used for industrial purposes and the manufacture of coke, 25 per cent by railroads, and 18 per cent for domestic purposes.



Since the discovery of petroleum in western Pennsylvania in 1859, our production has grown to enormous size. For several decades Pennsylvania led, but new fields were located and opened and production spread to Ohio, West Virginia, Kentucky, Indiana, and Illinois; to the Mid-Continent Field of Texas, Oklahoma, and Kansas; on westward to the California Field, and to the Rocky Mountain Field of Wyoming. At various times many of these states have led in production, but now California and Oklahoma compete for first rank. It is probable that the peak of production was reached in 1926 when the enormous amount of 775 million barrels was taken from our wells. During recent years we have produced nearly seven-tenths of the world's output, a ratio the maintenance of which seems improbable. Since estimates indicate that fully half our reserves have been used, it is likely that the remainder will be practically exhausted within the next few decades as we are producing, exporting, and consuming at a suicidal rate. As exhaustion approaches and prices

Courtesy Samuel S. Wyer.

FIG. 38.

The large coal reserves—mechanical energy—of the world are held by a few countries, United States, Canada, and China having more than four-fifths.

become higher, we must turn to our large reserves of oil shales. However, it is clear that a substantial advantage will lie with the nation possessing the cheaper liquid oil.

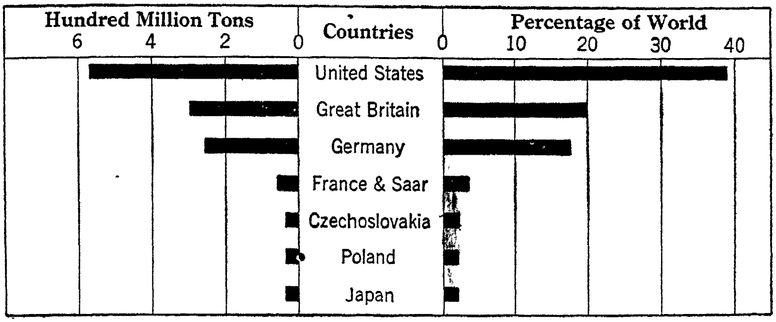


FIG. 39.—Principal Coal Producing Countries. Average, 1922–1924.

The United States produces nearly two-fifths of the world's annual output of coal, and more than Great Britain and Germany combined.

EXPLOITING OUR FORESTS

The Passing of Our Virgin Forests.—To the early explorer and settler America appeared like a vast unbroken forest. To him a future shortage of timber must have seemed impossible. Nearly half the area now within the United States was forested at that time. To the pioneer the trees were a serious handicap and had to be removed for agriculture and settlement. Fully 200 million acres were cleared for this purpose, and three-fourths of the timber removed was wasted as there was no market. Later the demand for lumber led to rapid exploitation of the virgin forests. The fine northern forests extending from New England to Minnesota—the land of the stately white and Norway pines—was one of the first to be attacked. The excellence of its timber and its location on the Great Lakes waterway and near the centers of large population favored rapid removal.. The central hardwood forest occupied large areas of agricultural land, and little now remains except on rough mountain and hilly tracts, or in farmer's woodlots. The southern forest is now falling before the advance of the lumberman. It is here that we secure most of the yellow pine which constitutes more than a third of the total lumber production of the United States (Fig. 46.) and here we have the second largest lumber-producing state—Louisiana. The Rocky Mountain forests are located in scattered areas, difficult of access and remote from markets, and hence have been exploited but little. However, they do not constitute a large timber resource. The Pacific Coast forests, with their Douglas fir, redwoods, spruce,

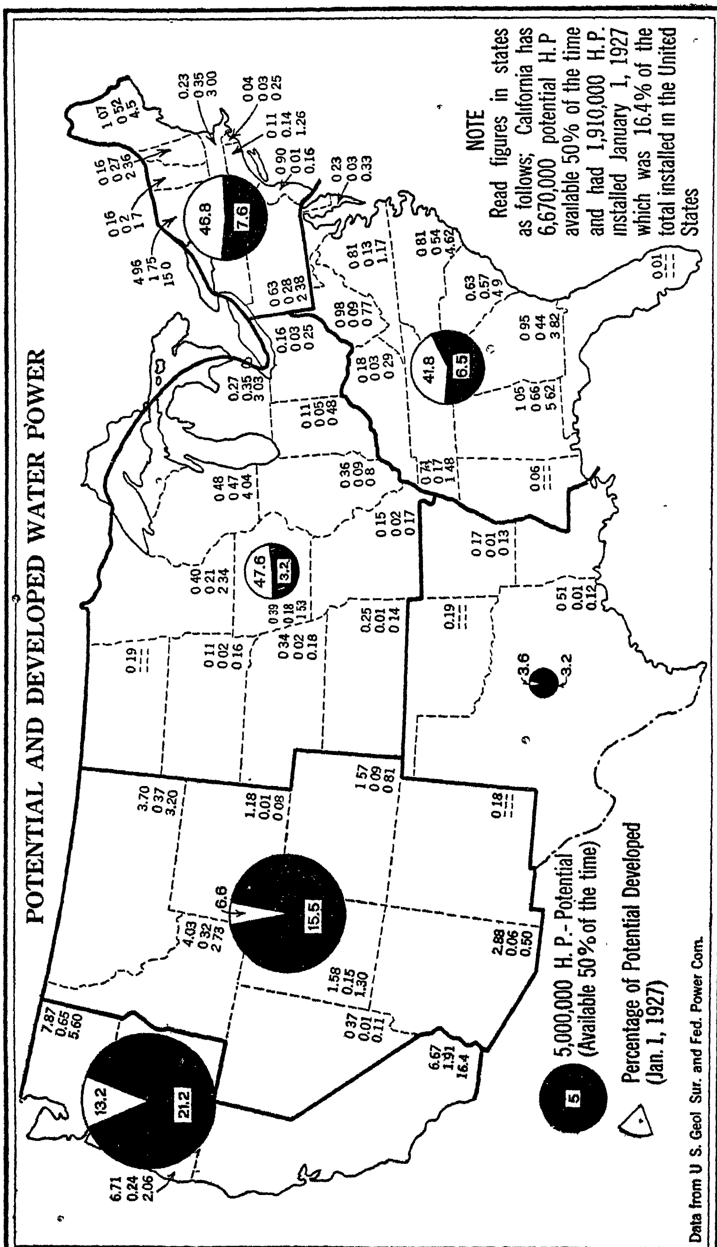


FIG. 40.

Nearly 73 per cent of the potential water power of the United States is in the Pacific and Mountain sections, and 68 per cent of the developed power is in the eastern sections. (Data available January 1, 1928, show 12,296,000 H.P. developed, an increase of 575,000 H.P., during 1927.)

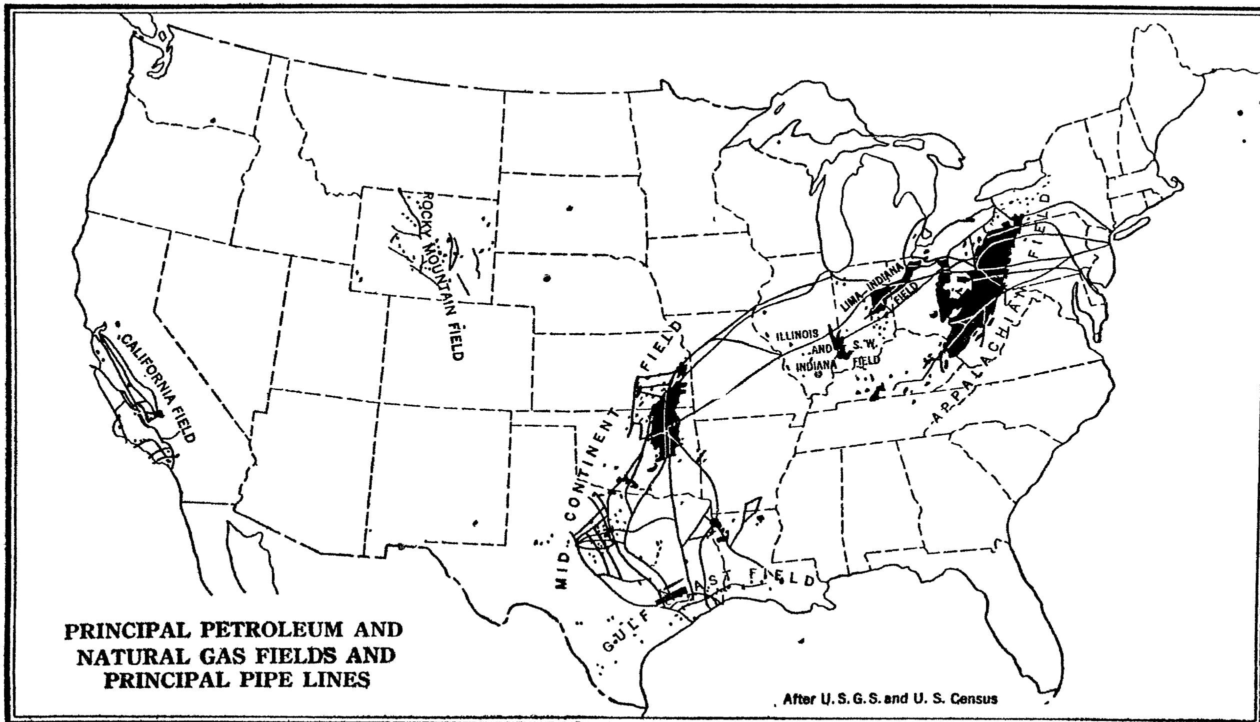


FIG. 41.

The Mid-Continent and California fields now lead in production. An extensive system of pipe lines provides low cost and maximum efficiency in petroleum transportation by land

cedar, yellow pine, and giant sequoias, are among the finest in the world. The warm summers, mild winters, heavy rainfall, and deep soil of this

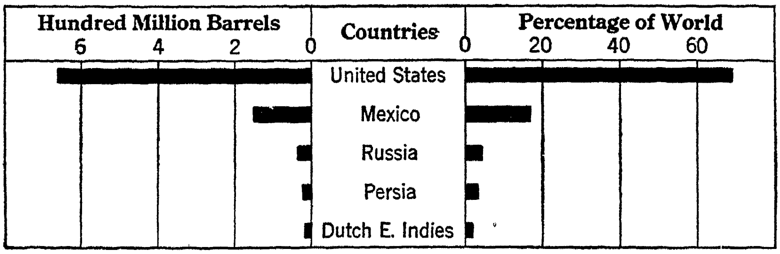
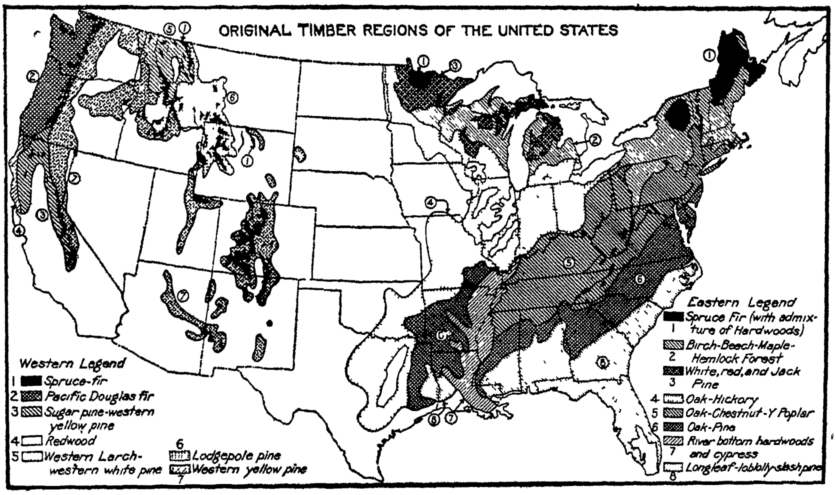


FIG. 42.—Principal Petroleum Producing Countries. Average, 1922–1924.

The United States contributes nearly seven-tenths of the world's annual petroleum production, and together with Mexico 77 per cent.

region make ideal conditions for tree growth. Here still stands half of the remaining saw timber of the United States, of which more than a quarter is Douglas fir and a tenth yellow pine. Exploitation of these

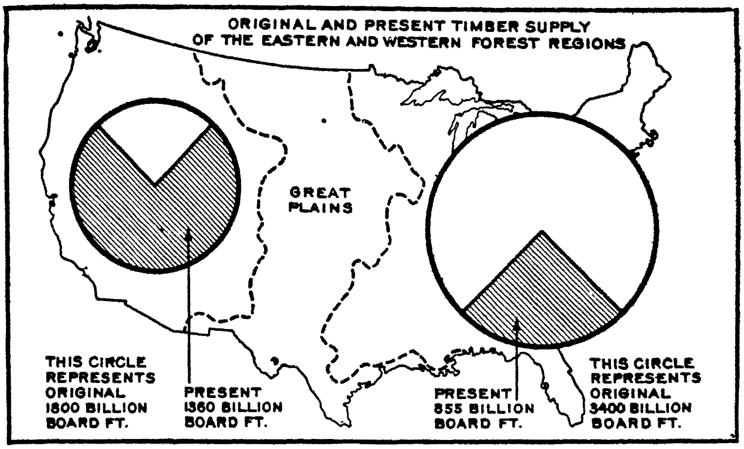


Courtesy U. S. Forest Service

FIG. 43.

Much of our country originally carried forests of highly useful timber. Three-fourths of the present forest land is in the East and one-fourth in the West but the latter carries more than three-fifths of the remaining saw timber.

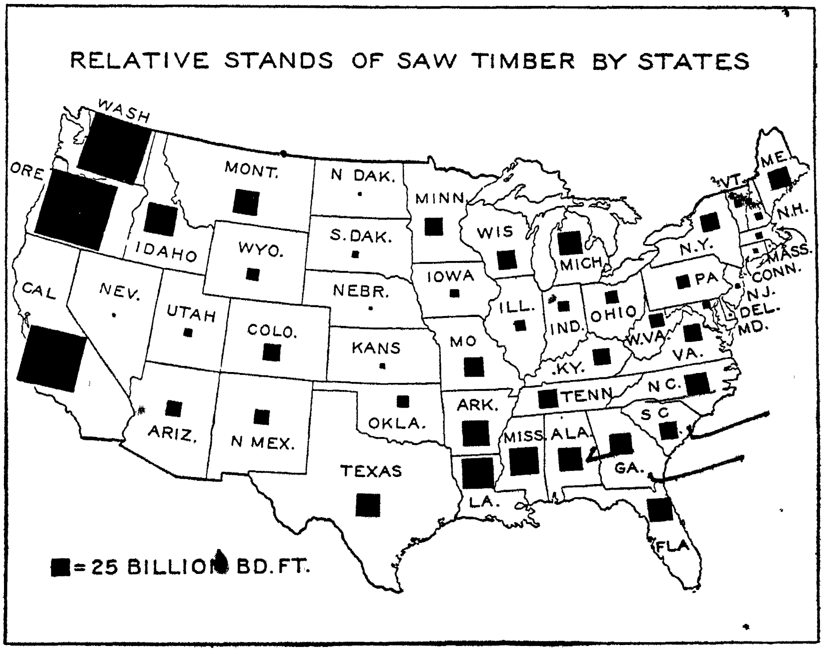
splendid forests is now progressing rapidly. Washington ranks first among the states in lumber production. To-day about two-thirds of our original forested area has been cut-, culled-, or burned-over, and fully three-fifths of the timber is gone.



Courtesy U. S Forest Service.

FIG. 44.

Originally 65 per cent of our timber was in the East but only a fourth of the original stand remains and this constitutes less than two-fifths of the total reserves of the country.



Courtesy U. S. Forest Service.

FIG. 45.

Most of our timber reserves are in the Pacific States and the South. The northeastern quarter of the country now consumes far more than it produces.

Production and Depletion.—We have removed the forests as we would coal from a mine, with little thought of a new crop. The United States is the largest wood consumer in the world. It uses annually

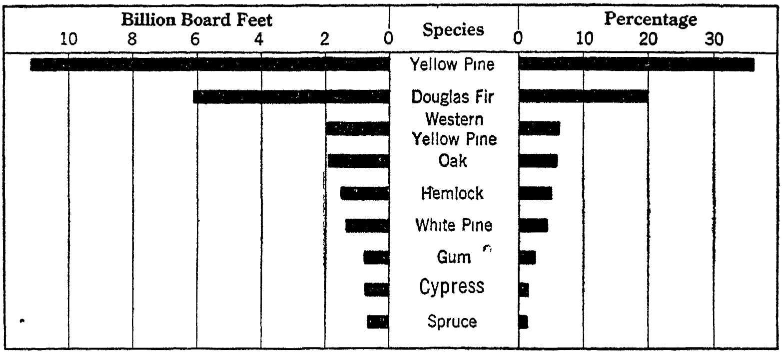


FIG. 46.—Lumber Production of the United States by Leading Species. Average, 1920–1922.

Two-thirds of our timber consumption is softwood—pine, fir, hemlock, and spruce. Yellow pine supplies more than two-fifths and Douglas fir one-fifth.

nearly half the lumber, nearly a third of the firewood, more than half the paper—$22\frac{1}{2}$ billion cubic feet,—or about two-fifths of the wood in all forms. This enormous demand has produced a destructive drain upon our forest resources. To-day only about two-fifths of the original supply of timber remains; only about a sixth of the original forested area carries virgin timber; only about an eighth, second-growth saw timber; about a sixth, cordwood; and a tenth is unproductive. Three-fifths of the remaining stand of saw timber is west of the Great Plains, with half in the Pacific Coast states, and nearly a fourth in the Gulf and South Atlantic section. (Fig. 48.) Since nearly half is consumed in the northeastern quarter of the country, it means a long haul and high cost. It is these sections that are now supplying our home needs, and a surplus for export which amounts to about a tenth of our annual

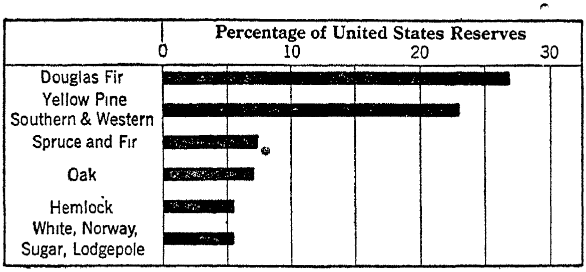


FIG. 47.—Principal Species of Trees Constituting Saw Timber Reserves.

More than a quarter of our saw timber reserve is Douglas fir and more than a fifth is yellow pine. Compare with Figs. 46, 49, 52.

cut. Forty-two per cent of our lumber is now coming from the southern and western yellow pine, and about 20 per cent from the Douglas fir. Most of the pulp wood and paper is produced in the northeast where cutover land and small trees are utilized, where water power is available, and where the markets are nearby. We also produce from two-thirds to three-fourths of the world's naval stores, chiefly from our southern forests.

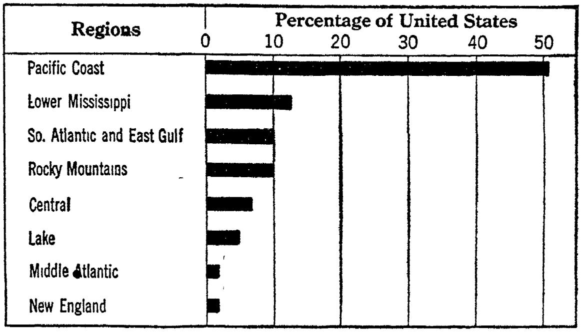
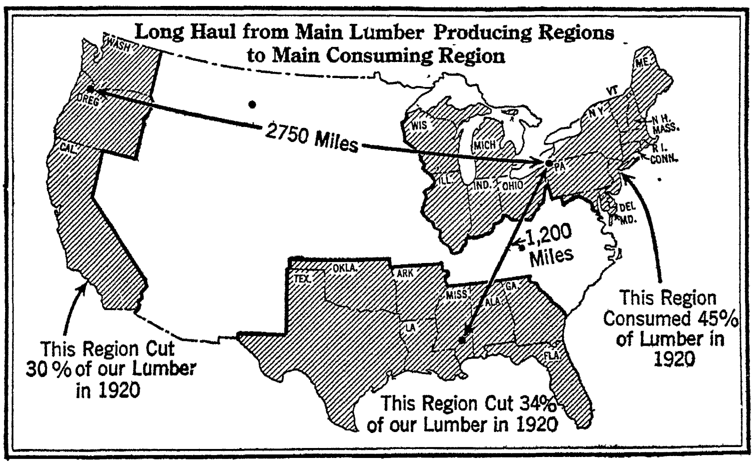


FIG. 48.—Distribution of Standing Saw Timber in the United States.

More than a quarter of our saw timber reserve is in the Pacific States and nearly a fourth is in the South.

Two-thirds of the timber consumed in the United States is softwood—pine, fir, spruce, hemlock,—and the coniferous saw timber is being



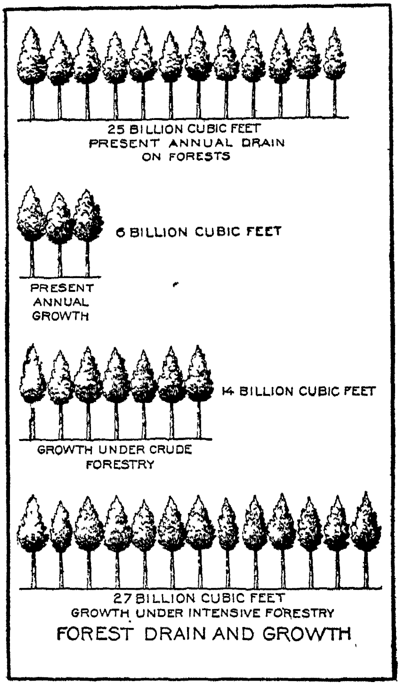
Courtesy of U. S. Forest Service.

FIG. 49.

The northeastern section of the United States consumes 45 per cent of our lumber, and the Pacific and Southern States produce 64 per cent. In 1920 New York's rail freight bill on imported lumber exceeded $22,000,000, while that of the three Lake States, formerly famous for their lumber production, was in excess of $30,000,000.

removed eight and one-half times as fast as it grows. The annual rate of forest depletion from all causes is now more than four times the annual

growth. Though many economies can and should be practiced, though numerous substitutes for wood may be used, many new uses for wood are being developed and the demand continues. In the last analysis, there is one real solution to the forest problem that now confronts us; we must *grow trees*, and cease to *mine* our forests. If intensive forestry comparable to that of Scandinavia, Germany, and France, is practiced, our 470 million acres of forest land can produce all we now use and a surplus margin of 20 per cent for future requirements. Thus far we have followed a policy of immediate profit rather than one of provision for future need. The best welfare of our country demands a complete reversal of this policy.

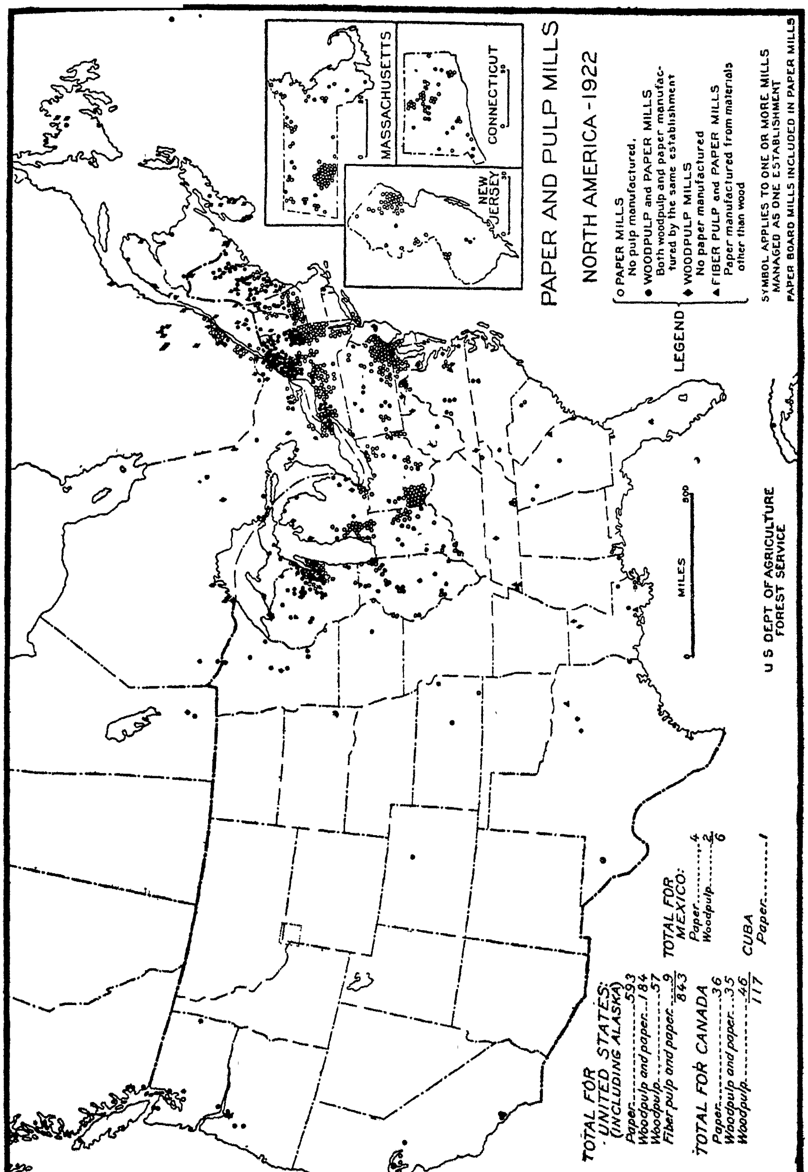


Courtesy U. S. Forest Service.

FIG. 50.

Our forests are being depleted about four times as fast as they are growing. The present annual depletion is almost as great as the growth would be under the most intensive forestry methods.

Our National and Other Public Forests.—Probably because of the popular belief that our forests were inexhaustible, the Federal Government was slow in becoming an active leader in conservation. Federal funds were appropriated for forest investigations as early as 1876, but nothing was accomplished. The first reserves were created in 1891, but no National Forest was so designated until 1905, when a forest policy was definitely established for the first time. Additional areas have since been set aside or purchased until the total area of our National Forests is now 137,000,000 acres. To this may be added about 10,000,000 acres set aside by states and municipalities, and 20,000,000 in Alaska. Only part of this area is productive forest land. However, about three-tenths of our remaining saw timber is in our National and other public reserves, exclusive of Alaska, and the remainder is privately owned. Vast areas must be planted and protected from fire and disease, and growing a tree crop on private lands must be encouraged if our future needs are to be met. (Fig. 204.)



Courtesy U. S. Forest Service.

FIG. 51.

Nearly all the woodpulp and paper mills of the United States are located in the North Atlantic and Great Lakes States.

OUR MANUFACTURES

Growth.—Agriculture is fundamental, while mining and manufacturing are secondary. This was strikingly true in the development of our country until comparatively recent times. For many years, cheap land was abundant, population was small, and anyone could have a farm by winning it from the forest or prairie. The numerous opportunities for the individual to gain ample reward independently were unfavorable to the factory system of manufacturing, which requires regularity of routine labor for others. During our Colonial period, manufacturing was insignificant. Only cotton and iron manufactures

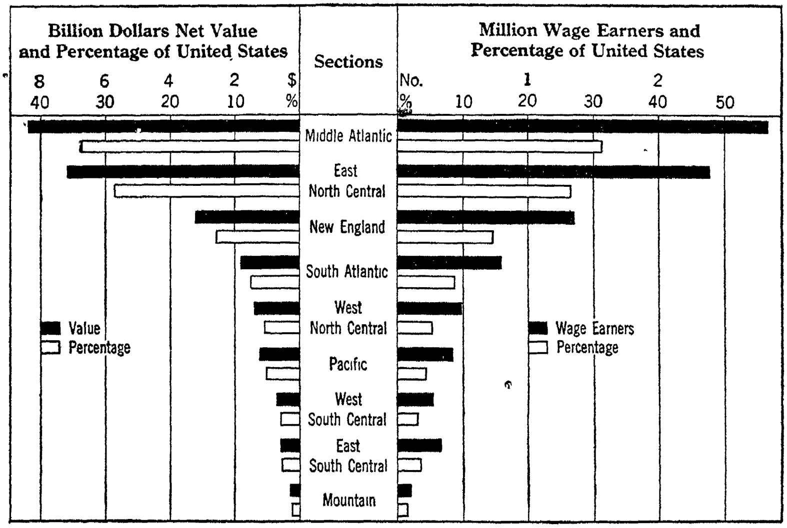


FIG. 52.—Manufactures by Sections in 1919.

The Middle Atlantic and East North Central (Great Lakes) sections produce 62 per cent of the net value of our manufactures and an additional 13 per cent is produced in New England.

had made much progress by 1830. Though the country began to feel its manufacturing power before the beginning of the Civil War, only since about 1870 have we really discovered and begun to utilize our great resources. Those varied and abundant resources, in a land of large size, have led to manufacturing on an immense scale by huge industrial organizations unequaled in any other country. Here again, our country expresses itself in the superlative. Thus far we have gone on by exploiting our natural resources while our population has been rapidly increasing—a process that cannot continue indefinitely. Clearly there must be an elimination of waste or a decrease in rate of population growth, or

opportunities will vanish and our people will be obliged to seek homes in other lands as have many of those of European countries. Both requirements now seem assured. Farms, forests, mines, and factories are completely dependent on each other for their fullest development. Their abundant products provide for transportation and commerce and for a

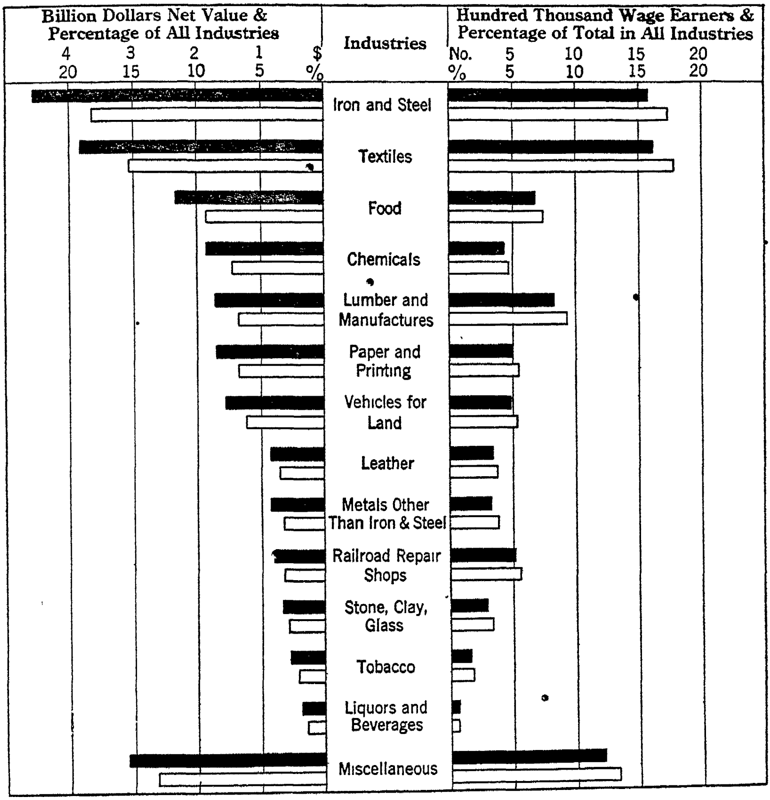


FIG. 53.—Manufactures of the United States by Great Groups of Industries in 1919.

Measured in terms of net value and number of wage earners, the iron and steel and textile industries lead all other groups. The diagram shows large diversification and numerous groups of about equal importance.

prosperous people. Since we possess all the fundamentals of national prosperity—power, agricultural land, raw materials, labor, capital—it appears certain that the conversion of our raw materials into finished products and their sale in foreign markets will enable us to maintain our high standard of living, provide abundantly for our people, and continue our manufacturing progress far beyond that of any other nation.

Our Present Position.—Our country is the leading manufacturing nation of the world. The total value of its products reaches the huge sum of $62,400,000,000; the net value[3] of $25,000,000,000 (which is a more accurate measure of the significance of the manufacturing process); and 10,800,000 people are employed in its mills and factories. Probably not less than five times that number of people are directly or indirectly dependent upon them. The iron and steel and the textile groups produce a third of the net value and employ more than a third of the country's manufacturing wage earners. These are followed in order by food, chemicals, and lumber products. Among individual industries, foundry

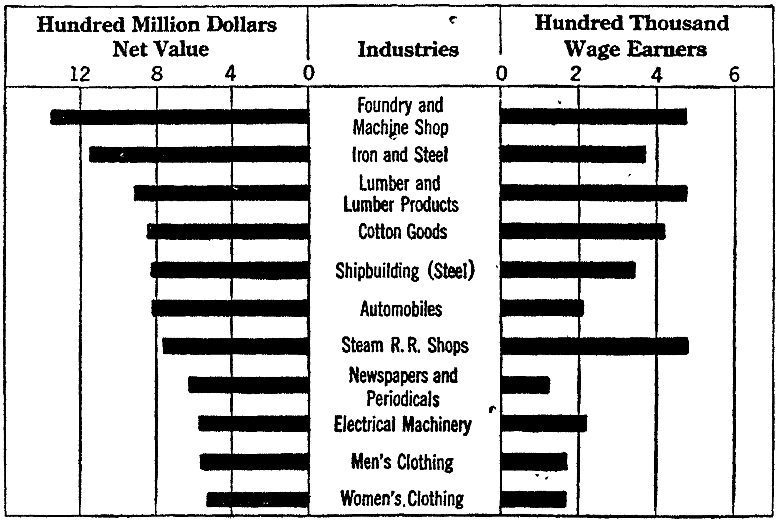


FIG. 54.—Leading Manufacturing Industries of the United States.

Foundry and machine shop, iron and steel, and the lumber industries lead in net value of products. Slaughtering and meat packing leads in product-value but its net value is relatively small.

and machine shops, iron and steel, lumber and timber products, and cotton goods rank first in net value, though slaughtering and meat packing stands first in total value owing to the relatively high value of the raw materials. (Figs. 52-54.)

Distribution of Manufacturing.—The principal manufacturing region of the United States occupies a comparatively small strip of country extending from southern Maine and central Maryland westward to Iowa

[3] The terms "net value" and "product value" are suggested and here used in place of the cumbersome forms,—"value added by manufacture," and "value of manufactured product." However, both forms will be found in this book. Which is preferable?

and Missouri. Portland, Baltimore, St. Louis, and Milwaukee may be taken as the end cities of this strip. (Fig. 55.) This small strip contains about a tenth of the area of the United States; produces at least two-thirds of the total value of its manufactured products; has nearly half the population; contains the first fourteen leading industrial cities, all except six of the first twenty-five, and nearly four-fifths of all cities whose manufactured products equal $100,000,000. Here are essentially all the industrial organizations operating on a huge scale. New York, Illinois, Pennsylvania, and Ohio are leading states; and New York, Chicago, and Philadelphia, the leading cities. In many respects the region resembles the Ruhr–Rhine–Belgium section of western

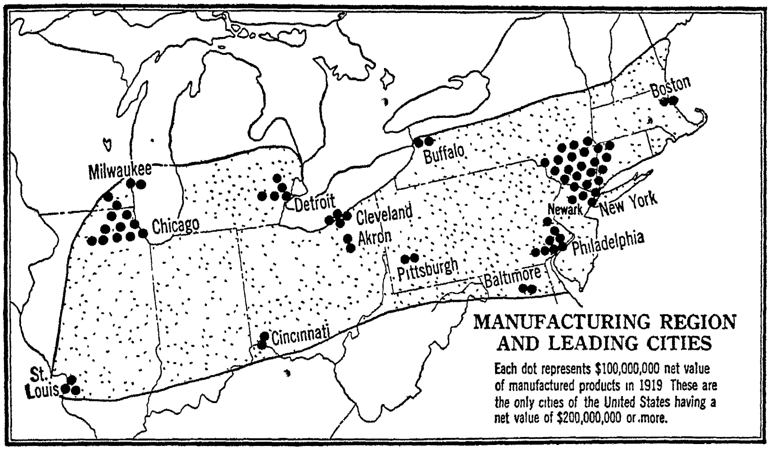


FIG. 55.

The region shown by shading on this map contains only about a tenth of the area of the country, but it has about half the population and produces at least two-thirds of our manufactures measured by product-value. Within it are the first 14 leading industrial cities and 19 of the first 25.

Europe where industry has reached a high stage of concentration. The reasons for this localization in America are largely geographic, as this region is especially favored in its natural-resource equipment, possessing (1) abundant, accessible power in the form of coal, oil, gas, and water; (2) great variety and abundance of agricultural raw materials produced within or readily accessible to it—cotton, live stock, cereals; (3) great variety, abundance, and accessibility of important minerals—iron, coal, copper, lead, zinc; (4) excellent home markets which are both a cause and an effect of the industrial development, and accessibility to foreign markets; (5) excellent transportation facilities by railways, inland waters, and by sea; (6) abundant skilled labor and ample capital; and (7) the momentum of an early start.

Among other factors favoring industrial development in the United States and shared by this region, but in which it has no superior advantage over some other sections, should be mentioned; (1) a healthful, invigorating climate; (2) self-sufficiency in food supply; (3) a strong government assuring stability and giving assistance; (4) a standard of education for the masses far above that of other countries; (5) a consuming population having a high standard of living; and (6) a capable, energetic people derived from the progressive stocks of industrial Europe. Taken as a whole, these constitute the industrial assets of our country.

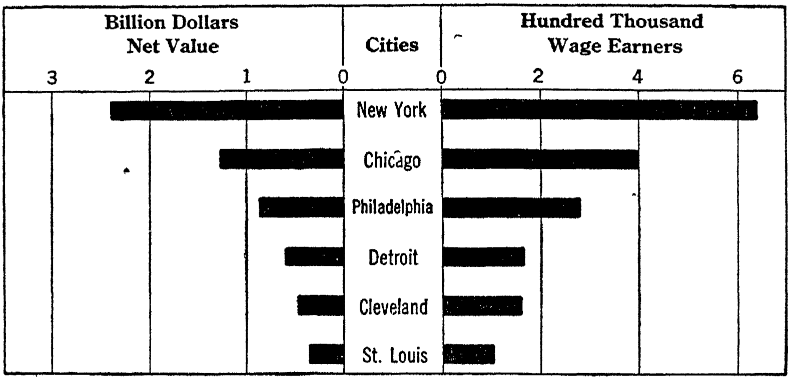


FIG. 56.—Leading Manufacturing Cities of the United States in 1919.

New York, Chicago, and Philadelphia are the three outstanding manufacturing cities of the United States. The six leading cities are ocean, lake, or river ports.

TRANSPORTATION AND COMMUNICATION

The facilities for transportation and communication and the use made of them are indices of the material development of a country and the general level of prosperity of its people, as they are both the cause and the effect of industrial progress. Chief among such facilities are railroads, highways, waterways, motor cars, telegraph, telephone, and postal service. Though the United States has only about 6 per cent of the world's population, it has approximately

(1.) 36 per cent of the world's railroad mileage,
(2.) 52 per cent of the world's railroad freight tonnage,
(3.) 31 per cent of the world's telegraph-wire mileage,
(4.) 23 per cent of the world's telegraph messages,
(5.) 62 per cent of the world's telephone wire mileage,
(6.) 63 per cent of the world's telephone instruments,
(7.) 83 per cent of the world's automobile passenger cars and trucks, and
(8.) 36 per cent of the world's mail.

In the distribution and use of these facilities per 10,000 inhabitants, the United States excels any of the principal nations having a large population, but is exceeded in a few cases by countries having a small population, such as Australia, Canada, and Argentina.

TABLE V

DISTRIBUTION AND USE OF TRANSPORTATION AND COMMUNICATION FACILITIES IN A NUMBER OF LEADING COUNTRIES

Distribution per 10,000 Population

	Railroads		Telegraphs		Telephones		Pieces of Mail, 000 omitted	Automobiles and Trucks
	Mileage	Freight, Net Tons	Wire Mileage	Number Messages	Wire Mileage	Number Instruments		
United States	24.8	186,378	174.6	17,171	3,525	1,357	2,180	1,664
United Kingdom and North Ireland	4.4	77,781	57.5	15,961	1,082	237	1,392	175
Germany	5.5	59,140	80.3	10,930	999	346	983	37
France	6.6	63,541	125.0	13,762	218	133	1,155	147
Russia	3.0	4,698	29.0	6	42	8	47	1
Italy	3.4	13,918	62.2	6,404	270	35	497	24
British India	1.5	3,982	18.7	771	7	1	55	2
Japan	1.7	14,106	28.0	12,792	214	92	801	4
Australia	52.1	59,196	11.5	29,118	270	35	497	364
Argentina	26.5	?	74.8	24,307	478	164	1,728	149
Canada	45.6	119,613	308.0	19,852	2,929	1,148	1,365	127

Railroads.—The eastern half of our country is provided with a close network of railroads so that no productive area is far from transportation facilities, while the western half, which is drier and less productive, is crossed by several trunk lines. Thousands of miles of navigable rivers are available, but the total freight carried by rivers is small (about 53 million tons) compared (1) with that moved by the railroads, or (2) with the possibilities of rivers as carriers when we have a population as static and as dense as that of western Europe. There are many reasons why railroads meet the demands of modern industry more effectively than do rivers and canals: (1) Railroads may reach the resource to be developed and the industrial center to be served, and a network of facilities may be provided to any section by building branch lines. (2) Through shipments are obtainable on railroads to every important center in the country, and even to the door of the industrial establishment, thus reducing truckage and handling costs to the minimum. (3) Railway transportation is much faster. (4) Railways operate throughout the year while many rivers are closed to traffic by ice and some by low water during

part of the year. (5) The shipping risk by rail is less than by water. (6) Railroads can readily meet the shipping needs by varying the size and frequency of trains, thus controlling the cost.

Waterways.—In contrast with our rivers, the Great Lakes provide the greatest inland waterway of the world whether measured by extent or volume of traffic. The total tonnage (U. S.) carried on them annually is nearly half as large as the combined tonnage of our Atlantic, Gulf, and Pacific coasts, while the tonnage passing through the Soo Canal is about three times that of the Panama Canal. Because of the economies possible in handling such a large volume of bulk cargo—iron ore, coal, grain, lumber—it is probable that the freight rates on the Lakes are lower than for any unsubsidized water service in the world. It is now proposed to open the Great Lakes to sea-going vessels by deepening the St. Lawrence route to permit the passage of ships of 25-feet draft from Lakes to tidewater. The arguments of the proponents of this plan remind one of the extravagant claims advanced at various times in the past when the building of sundry other canals was being considered. The arguments of the opponents are equally vigorous, and the two groups make clear the influence of geographic location and resources in the development of sectionalism—the Middle West demanding a cheap water outlet, and the North Atlantic Region being desirous of retaining the former as a part of its hinterland. The best evidence available at present appears to favor the construction of the proposed waterway.[4]

OUR FOREIGN COMMERCE

Nature of Commerce and Conditions Giving Rise to It.—Commerce, or trade, is the movement of products from regions of surplus to those of deficiency. Such movement may be over comparatively short distances, as from farm to adjacent city, or may be over great distances, as between countries located on opposite sides of the earth. Commerce depends primarily upon the wants of people, the ability of those people to pay for the thing wanted, and the ability of other people to produce and transport it or have it transported. The conditions that result in a surplus in one region and a deficiency in another may be geographic, racial, economic, or political, differences in geographic environment being the more important factors. Among the differences giving rise to commerce are the following: (1) differences in climate, e.g., tropics *vs.* mid-latitudes; (2) differences in soil, mineral, forest, and other natural

[4] Senate Doc. 183, 69th Cong., 2d Sess. Message from President of the United States. 1927; Gregg and Cricher, Great Lakes-to-Ocean Waterways. Dom. Com. Ser. No. 4, U. S. Dept. of Com. 1927.

resources, e.g., coal, petroleum, lumber; (3) differences in distance to markets, e.g., fresh vegetables *vs.* cotton, silk, or wheat; (4) differences in relief, e.g., between highlands and lowlands; (5) differences in the stage of cultural development—"civilization"—and in specialization, e.g., a manufacturing people *vs.* an agricultural one, and the distinctive artistic wares of the French or the lacquer wares of the Japanese; (6) differences in political policies which result in tariffs, rebates, subsidies, etc. The differences in climate, soil, topography, and other natural resources within the United States give rise to an enormous domestic commerce, and the same conditions produce a large surplus that enters foreign commerce. It is the latter with which we are especially concerned here. (Study Figs. 57–61.)

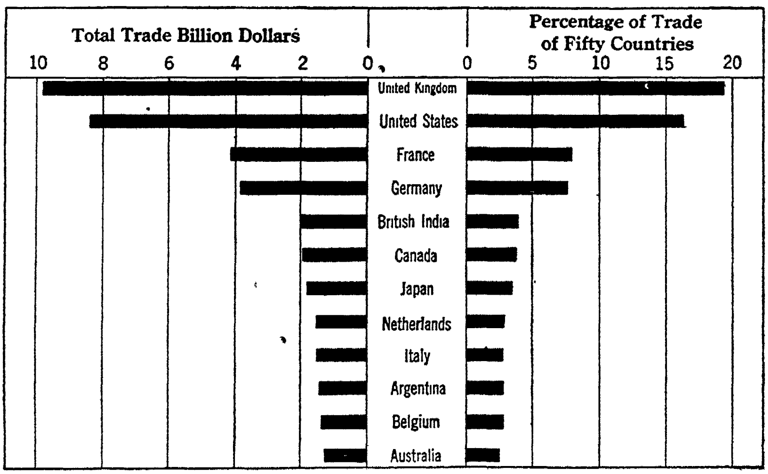


FIG. 57.—Foreign Trade of Leading Nations. Average, 1923–1925.

The United Kingdom and the United States carry on approximately a third of the foreign trade of the world measured in value, and France and Germany together a little more than a seventh.

Development of Our Foreign Commerce.—Foreign commerce was a vital factor in our early Colonial period. The hinterland of the colonist was largely untraversed and undeveloped and hence he looked outward across the ocean to the markets of the more developed "mother countries" from whence he came. For many years he sent his produce, chiefly raw materials, to Europe and other parts of the world, and imported manufactured wares. During the colonial period and for many years following the Revolutionary War, American ships carried most of the trade, averaging from four-fifths to nine-tenths up to 1830 and about two-thirds at the beginning of the Civil War. The loss of vessels during the Civil War; the rapid expansion westward and the

development of our agricultural lands and vast mineral and forest resources following the war, and the consequent opportunity for invest-

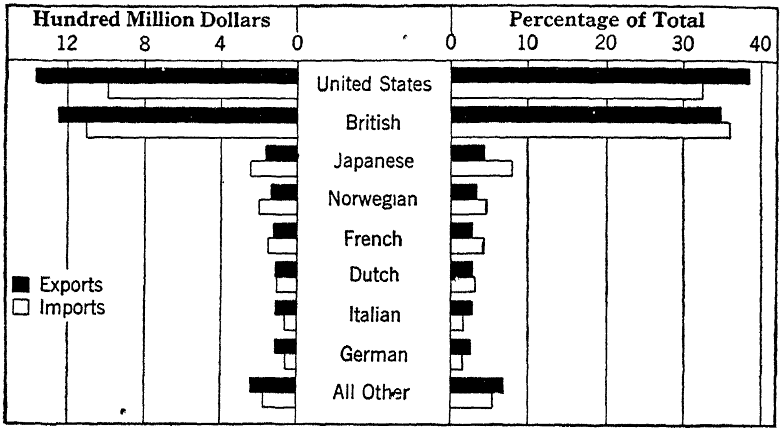
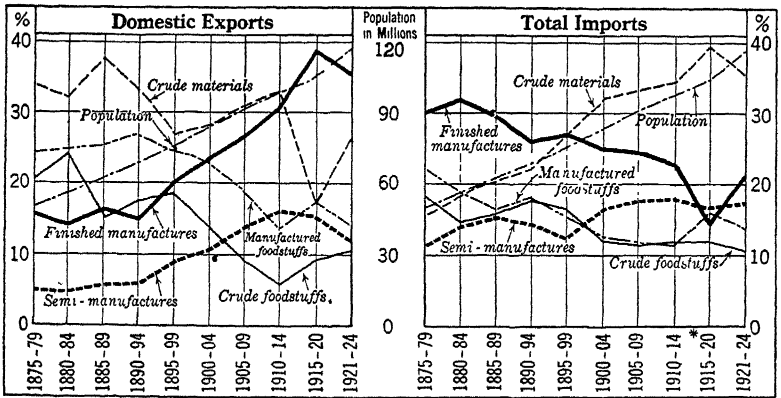


FIG. 58.—Nationality of Vessels Carrying American Foreign Trade. Average, 1922–1924

American and British vessels carry more than seven-tenths of our foreign trade measured by value, each carrying equal amounts.



* Fiscal years before and calendar years after 1915

FIG. 59.—Changing Character of the Foreign Commerce of the United States as Shown by Percentage of Value.

Our population increase has been accompanied by a decrease in exports of foodstuffs and crude materials and an increase in manufactured products. At the same time we have decreased our importation of finished manufactures, increased slightly semi-manufactures, and increased greatly crude materials. Are these desirable changes? What is the future trend likely to be?

ment at home; the change from sailing to steel steamships; and the repeal by Congress of laws that favored American shipping led to a rapid decline to less than a tenth in 1890. Not until 1900 did the total

value of our foreign trade exceed 2 billion dollars. The more complete development of our natural resources, the expansion of manufacturing to surplus production, a corresponding demand for foreign raw materials, and the stimulus of the World War, have renewed our interest in

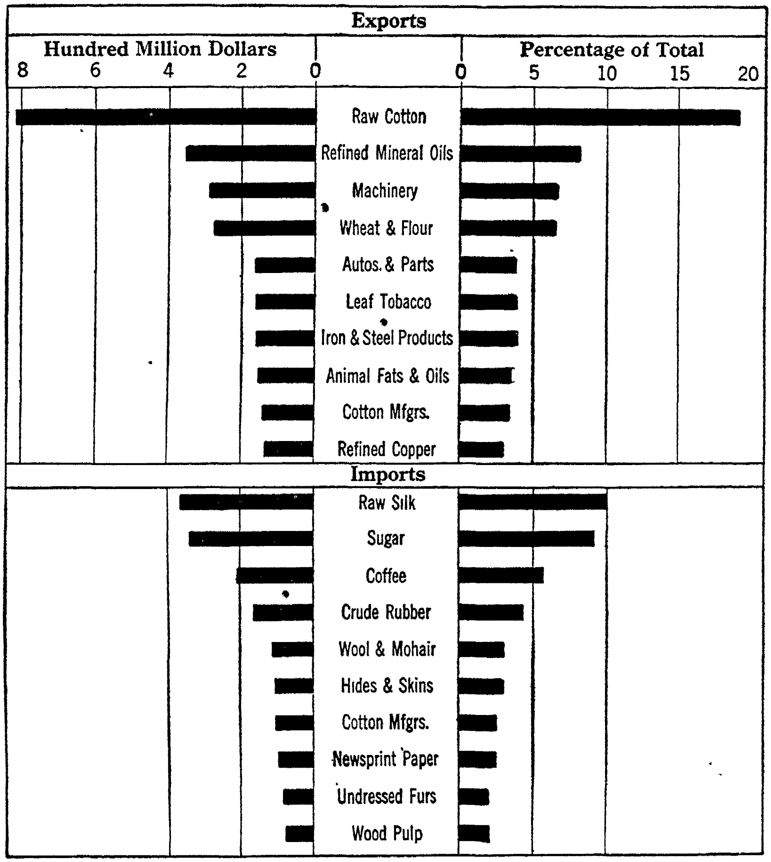


FIG. 60.—Commerce of the United States: Leading Commodities Exported and Imported. Average, 1922–1924.

Raw cotton constitutes nearly a fifth of the total value of our exports, its value being more than twice that of refined mineral oils, which ranks second. Raw silk and sugar are our leading imports, comprising about a fifth of the total value.

foreign commerce and an American merchant marine. To-day we are the second leading commercial nation, exceeded only by Great Britain in total value of foreign trade and tonnage of merchant vessels. Nearly 36 per cent of our foreign trade (value) is carried in American bottoms and only slightly less in English vessels.

The Character of Our Commerce.—The changing character of our commerce during the last half century is shown in Fig. 59, a change which reflects the extent of our internal development. The relative decline in exports of raw materials and foodstuffs has been accompanied by an increase in exports of manufactures and in growth in population. At the same time, crude materials and semi-manufactures have come to constitute a major proportion of our imports, and finished manufactures a minor percentage. We are now entering upon an era of greater economic maturity—manufacturing our own raw materials, as well as those

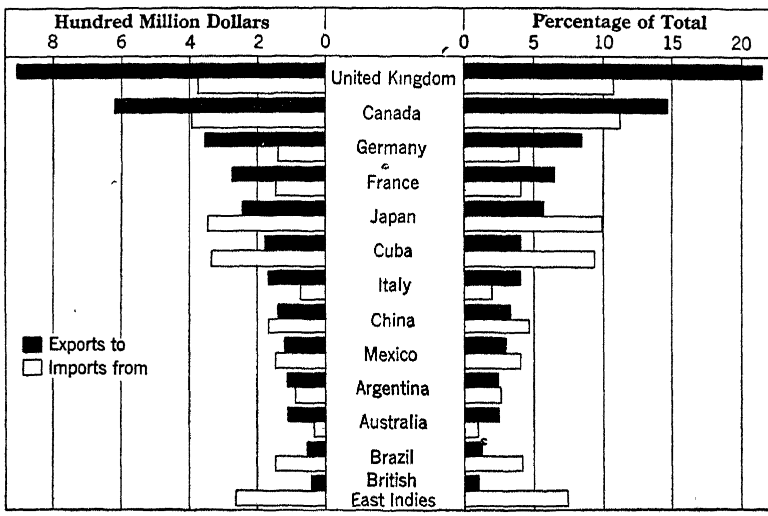


FIG. 61.—Trade of the United States with Leading Foreign Countries. Average, 1922–1924.

The United Kingdom and Canada are our best customers as they buy 36 per cent of our exports. We, in turn, purchase 22 per cent of our imports from them. Germany and France rank next as buyers of our goods, but we purchase more from Japan and Cuba, both of which sell us much more than they buy from us. We also make large purchases in Brazil and British East Indies compared with our sales. What commodities account for the fact that we purchase more from these countries than we sell to them?

imported, and seeking a foreign market for the finished products. Raw cotton is still our leading export, though our textile industries are taking an increasing amount of our production. Its value is more than twice that of any other commodity, contributes nearly a fifth of our total exports, and, with refined mineral oils, machinery, and wheat and flour, exceeds two-fifths. Our principal imports are raw silk and sugar, which are nearly equal in value and form a fifth of our total. The trade region of northwestern and central Europe is the chief market for our surplus (45 per cent) and also the principal source of our imports (25

per cent). More than a fifth of our total exports go to the United Kingdom, which supplies a tenth of our imports. Canada is a close second, with 15 per cent and 11 per cent, respectively.

Our Commercial Gateways.—Our foreign trade now follows well-established routes through a comparatively few ports of outstanding importance. These gateways have attained their prominent positions because of their superior geographic and economic conditions, such as (1) a large, highly productive, and easily accessible hinterland having a large population, and (2) good harbors possessing extensive and well-equipped dockage facilities. Since our highly productive area lies east of the Mississippi directly tributary to eastern ports, and since most of our trade is trans-Atlantic, our Atlantic Coast gateways handle more than half (57 per cent) of our total commerce, and combined with those of the Gulf Coast nearly three-fourths (73.3 per cent). Half our trade flows through the North Atlantic ports, and two-fifths through the single port of New York. Other important eastern gateways are Boston, Philadelphia, Baltimore, Norfolk, and Montreal in Canada. The total value of Galveston's trade is slightly greater than that of New Orleans, and the two handle 14 per cent of our overseas commerce. Our Pacific ports are few in number and their total commerce is only about four-fifths that of New Orleans and Galveston combined.

The preëminent position of New York in our overseas commerce is due to a number of influencing factors: (1) It has access to the rich hinterland previously mentioned, principally through the Hudson–Mohawk route by easy grades, but also by rail *via* the southern routes. (2) It has an excellent harbor open throughout the year with a developed waterfront of 346.5 miles, measured around piers and heads of slips, and a total potential frontage, including shore line, of 995 miles. (3) It is on the main trans-Atlantic trade route over which most of our commerce flows. (4) It is the financial center of the country. (5) It also has all types of facilities needed in handling foreign trade on a large and expeditious scale.

Our Commercial Future.—The future development of our overseas trade depends very largely upon the same factors that make possible our leading position in agriculture, mining, manufacturing, and transportation, which have been discussed elsewhere in this chapter. With a rich endowment of essential natural resources, with intensive production yet to be attained, and with good well-equipped harbors accessible to that richly endowed hinterland, it seems reasonably certain that the United States will continue to hold a large share of the world's commerce.

SUMMARY

With a great extent of level, varied, and fertile arable land; a healthful, invigorating climate highly favorable to abundant food production of high quality and great variety; an abundance of all essential minerals high in quality and readily accessible; an abundance of commercially available mechanical power; superior transportation and communication facilities; good harbors favorably located in relation to productive area and to principal world markets; a topography that favors unity rather than sectionalism; a racial stock derived from the most progressive peoples of the world; an educational system that tends to raise the general ability of the masses to a high level; a strong, stable government that rests upon the will of the governed and functions for their welfare, Our Country offers a home to man in which he should be able to live on a high standard and contribute to the welfare of the world and the advancement of the human race more effectively than have the people of any other land. Of such a country one should be proud to be a citizen, and such an appreciation should come from knowledge of the opportunities for human well-being offered. " Our Own United States " continues to be the land of opportunity for better living, primarily because of the abundant geographic resources available to man. The use he makes of them depends upon himself—the human factor.

PROBLEMS

1. Will the United States wield as great an influence in the human welfare of the world in the future as Europe has in the past?

2. Are geographic or human factors most important in the development of a nation?

3. Can the United States maintain twice its present population with the same standard of living?

4. Have the agricultural or the power and iron resources been most important in the development of the United States?

5. Will the large water power resources of the North Pacific States make them the leading manufacturing section of the future?

6. If Europe were organized as a single nation, would it be a better home for man than the United States?

7. Has agriculture or manufacturing wielded a greater influence in the development of the United States?

8. Can the United States maintain its position as the leading agricultural and manufacturing nation of the world?

9. Will the United States become the leading commercial nation?

CHAPTER IV

THE PHYSIOGRAPHIC REGIONS OF THE NORTHEASTERN STATES

The Major Divisions.—Most of the area of the Northeastern States lies within the Northern Appalachian Highlands. To the southeast is the bordering Coastal Plain, and on the northwest, bordering lakes Erie and Ontario, is the eastern edge of the Eastern Lake Section of the Central Lowland. (See Fig. 62 for the location and boundaries of the physiographic regions.)

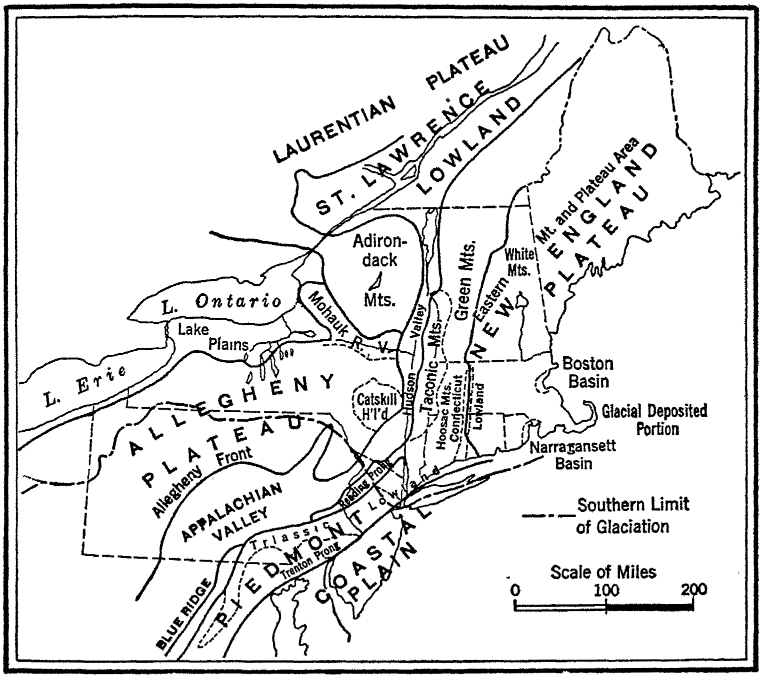


FIG. 62.—The Physiographic Regions of the Northeastern States.
(Boundaries mainly from Fenneman's Monograph.)

The major divisions of the Appalachian Highlands in these states are as follows:

1. New England Province.
2. Adirondack Mountains.
3. Allegheny Plateau.
4. Appalachian Valley Province—ridges and valleys in Pennsylvania but continued northward as the Hudson–Champlain depression.
5. Piedmont Plateau, with the Piedmont Upland and the Triassic Lowland.

The Appalachian Highlands may be divided into two portions: the Older Appalachians, composed of older rocks, such as granite, schists, slates; and the Newer Appalachians, composed of sedimentary rocks.

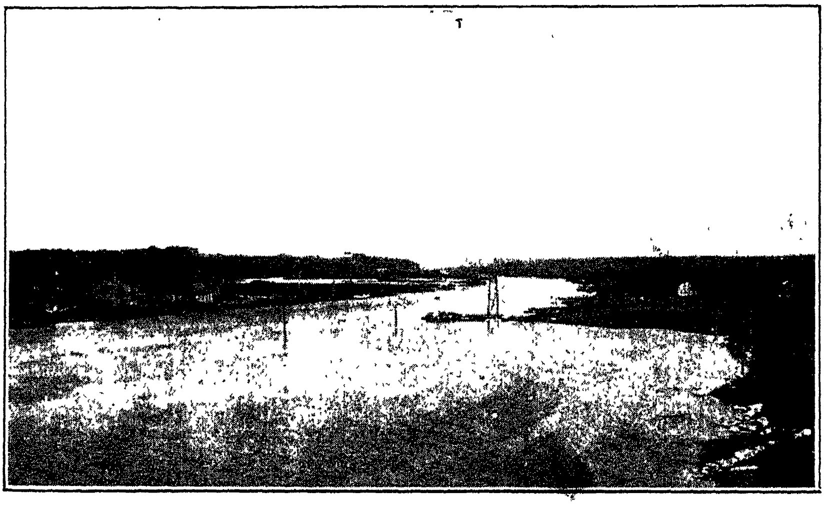


Photo by Parkins.

FIG. 63.—The Western Entrance to Cape Cod Canal.

This sea level canal, 12 miles long, excavated across the narrow strip of land between Buzzard's Bay and Cape Cod Bay, shortens the distance materially between New York and Boston by boats. The route around Cape Cod is dangerous at times.

Older Appalachia has its greatest areal extent in the New England States, and Newer Appalachia in the Middle Atlantic States.

The Atlantic Coastal Plain.—The Atlantic Coastal Plain includes Cape Cod peninsula, Nantucket and Martha's Vineyard, Long Island, and all of New Jersey southeast of a line from New York Bay to Trenton.

Cape Cod peninsula and the three islands just named have been the scene of glacial deposition, their surface features being characterized by morainic hills (knob and kettle type), mostly of sand, and outwash plains of sand and gravel. (Fig. 63.)

The outline of Cape Cod and the glacially deposited islands to the west have undergone some changes since glacial times. Waves and along-

shore currents have built barrier beaches and bars across the mouths of bays, and on the eastern coast of Cape Cod a vast amount of till has been removed and carried northward and northwestward around the end of the glacially deposited Cape Cod peninsula, forming an intricate series of hooked spits with enclosed lagoons and marshes. The wind has also been active on Cape Cod, and much of the low surface of the sandy spits has been built up by sheets of sand and dunes, the latter huge billows of sand. Provincetown is built on the southern side of a newly formed hooked spit.

The inner edge of the Coastal Plain in New Jersey is marked by the Fall Line that extends in a fairly direct line from near New Brunswick, New Jersey, near the mouth of the Raritan River, to Trenton, and on along the Delaware River to Delaware Bay. The Fall Line lies in a lowland. To the northwest the lowland is carved in shales and sandstones, farther on trap caps several isolated ridges; while to the southeast the lowland, which stands slightly lower, is cut out of limestone deposits. The two parts form the Inner Lowland of New Jersey. About 90 per cent of the population of New Jersey live on this Inner Lowland. Here are most of the large cities, most of the factories, and most of the railroad lines of the state. It is a part of that great thoroughfare that connects New York and Philadelphia, undoubtedly the most traveled strip of country in the United States to-day.[1] Along this Inner Lowland passed the trails of the Indians in pre-Columbian days. Post roads traversed it in Colonial times. In the softer limestone was dug the Delaware–Raritan Canal, to be paralleled only a few years later by one railroad line, and later by many. To the southeast of the Inner Lowland is the thinly settled New Jersey Coastal Plain.

Drowning of the east coast of the Northeastern States brings ocean waters to the edge of the New England Plateau from Cape Cod northward. Farther south, this process, for the most part, gives origin to Buzzards Bay, Narragansett Bay, Long Island Sound, New York Bay, the swamps of eastern New Jersey, and Delaware Bay. Because ocean vessels may tie up at wharves on the edge of the old land at New York and Philadelphia, commerce moves around both ends of the Coastal Plain area of New Jersey. It is not, therefore, a transit region, and there is not the demand for modern roads and railroads that there is over the lowlands on its inner border.

About three-fifths of the area of New Jersey is in the Coastal Plain; yet a much smaller fraction, relatively, of the agricultural products of the state comes from there than from the other sections, for the soil is for the

[1] In 1927 the Pennsylvania Railroad operated 50 passenger trains daily, 35 from 7 A.M. to 8 P.M., between New York and Philadelphia.

most part sandy and loamy and has been so thoroughly worked over by the waves and currents during its deposition that the percentage of soluble material is low. The surface is a plain sloping southeastward toward the ocean. The inner portion of the plain is highest, and here west-flowing streams have dissected the land. The lower courses of the east-flowing rivers are drowned and, therefore, have marshy borders and enter shallow marshy bays and lagoons, separated from the ocean by barrier beaches. There are no large cities on the Coastal Plain in New Jersey except Camden, and that is geographically a part of Philadelphia. Along the east coast are many resort towns. Long Beach and Atlantic City are the largest, their importance being due to the excellent bathing facilities and the nearness to large population centers.

Along the railroads that have direct connections with the large manufacturing cities, particularly in the marl belt near the western border, there are truck gardens, for the soil is easily worked, aërates well, drains well, is warm, and when well fertilized is suited to the growing of crops that do not demand rich soil for profitable yields. Large areas too sandy and too distant from shipping points to be profitably farmed are undeveloped, and are covered with forests of pine. In such sections one finds people living in isolation and poverty, in striking contrast to the wealth to be found in the Inner Lowland.

The New England Province.—The New England Province as a whole is an upland or plateau sloping southward, as the trend of the rivers indicates. The highest parts are in the north and west, the upland surface here reaching 2000 feet or more, with a few mountain peaks attaining heights of 3000–6000 feet. Crystalline rocks are the basal formation, and outcrop in various parts of the province, the larger areas being found in southern Maine, the White Mountains, Rhode Island, and the Green–Hoosac mountain range. The whole province was once peneplained, later tilted and slightly warped, dissected, the dissection being more pronounced in the north than in the south, and lastly glaciated. The less resistant rock areas have been worn into basins. Above the general level of the plateau are a few residuals or monadnocks which owe their height more to their location on stream divides than to superior hardness. Long before the erosive forces had formed the peneplain there had been warping, close folding, and faulting, so that many of the igneous and sedimentary rocks were metamorphosed into schists, gneisses, slates, marbles, and conglomerates. Limestones, shales, and sandstones, however, are to be found in some parts.

There are several recognizable sub-regions of the New England province. The Eastern Mountain and Plateau Area is a broad upland which reaches its greatest height and development in the White Moun-

tains but which also has, above the general level, Mt. Katahdin, Saddleback, and other peaks in Maine. This upland extends southward through New Hampshire, across Massachusetts, and dies out in northern Connecticut.

The Green Mountain region, represented in Vermont by the Green Mountains, in northern Massachusetts by the Hoosac Mountains, and farther south, extending into Connecticut, by a broad plateau surface, forms a western mountain section. The core of the Green Mountains in Vermont is a very ancient rock, but on the western flank there are marble deposits, derived from folded and metamorphosed limestones, that have long been quarried. The well-known Barre granite region lies on the eastern flank of the mountains.

The Green Mountains are highest in central Vermont to the north of Rutland, and, while they are barriers to transportation and communication in some sections, they are crossed in northern Vermont by two river valleys of low gradient; and in southwestern Massachusetts and northern Connecticut the ascent to the crest from either east or west is gentle. The Hoosac Mountains proved a barrier to canal making, and the builders of the first railroad from Boston to Albany had to construct the famous Hoosac Tunnel to avoid steep grades. The Mohawk Trail, a famous automobile road, crosses the Hoosac Mountains at an elevation of more than 2000 feet. In the days when Vermont was being taken up by settlers from both New England and New York, the latter, recognizing the effectiveness of the Green Mountains as a political boundary, strove to include western Vermont, west of the mountains, within its jurisdiction; this brought on a border warfare in which the "Green Mountain Boys," who fought to make Lake Champlain the western boundary, were victorious.

Between the Eastern Mountain and Plateau Area and the Green Mountains lies the broad valley of the Connecticut. This valley is partly due to warping, but the structural form has been further deepened and widened by stream and glacial erosion. During late geologic times the southern end of the Connecticut Valley in Massachusetts and Connecticut was warped below the level of the sea, and sand and mud were deposited. Sheets of igneous rock were intruded into these sedimentary rocks. Later the whole was elevated, faulted, tilted, and eroded; and to-day this lower valley is a lowland, the Connecticut Lowland, with ridges capped with igneous rock forming conspicuous features of the landscape.

Along the western border of the New England province is a third mountain sub-region, the Taconic Mountains, a part of the Newer Appalachian. This is a much-eroded, folded mountain region. There

are ridges of varying lengths of hard rock, separated by valleys carved in limestone. Between the Taconic ridges and the Green-Hoosac Mountain region [2] is another depression, floored with limestone. It is called by some the Berkshire Lowland. (Fig. 64.)

The Connecticut Lowland, the Berkshire Lowland, and the Lake Champlain Lowland, together with the Boston Basin and the Narragansett Basin, have the best agricultural lands in New England and, in the westward expansion of the New England people, were taken up by farmers before the bordering uplands.

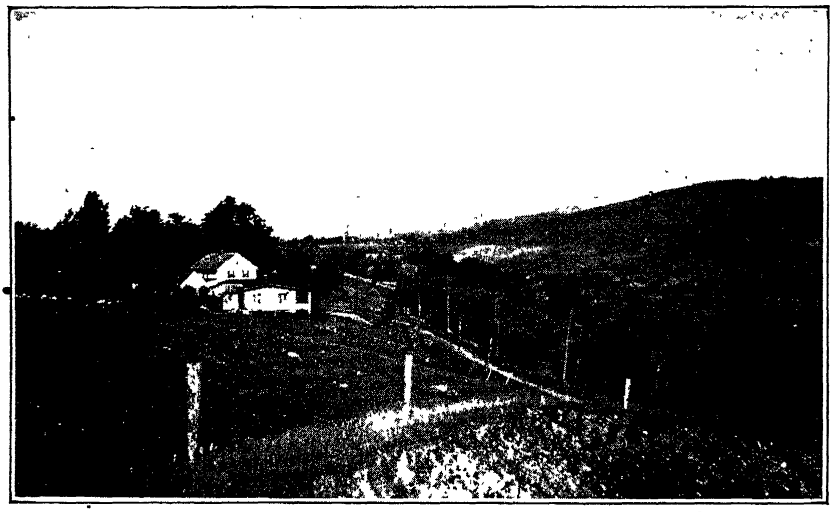


Photo by Parkins.

FIG. 64.—A New England Landscape near Pittsfield, Mass.

Most of the land is in slope, yet erosion is slight. Many of the larger hills have rock cores. Most of the smaller hills or knolls are heaps of glacial drift in which sand, gravel, and boulders predominate. Boulders may be seen in the field to the left of the road.

Effects of Glaciation.—No agency in the physiographic history of New England has exerted a more profound influence on human geography than has the glacier. The main topographic features sketched in the preceding pages were little affected by the southward-moving ice, but most of the minor surface features owe their origin to glacial processes. Although there are bare ridges and ledges here and there in New England, most of the land is mantled with morainic material or fluvio-glacial deposits. In many parts of New England, particularly in southeastern New Hampshire and eastern Massachusetts, drumlins are com-

[2] All the hill and mountain land of Berkshire County, western Massachusetts, is called the Berkshire Hills or the Berkshires.

mon. Most of the islands of Boston harbor are drumlins. Some of these drumlins have been cleared and are tilled, but most of them are too stony for any use except as forests or pasture lands.

In general, the soil is thin on the upland hills, ridges, and mountains, and it is on these areas of thin soil that one finds most of the abandoned farms, the increasing number of which has attracted the attention of so many students and writers for three-quarters of a century or more. To most students the abandoned-farm phenomenon is only a natural economic adjustment to the opening of the Middle West and the shifting of New England interests from agriculture to manufacturing. Following the Revolutionary War, for forty or fifty years, land in southern New England was scarce and many farms were established on the uplands where general farming and domestic economy did not demand an intimate contact with markets. The hill towns and hill farms were at their zenith about 1820–30 and many farms were taken up that would not have been had there been easy access to the West. The upland farmers were "marginal" farmers, who succeeded when there was little competition; but when the canal and railroads brought the products of the cheap lands of the Middle West to eastern markets, they were forced to better lands or to the cities. Many farms were worn out by one-crop agriculture, erosion, and excessive leaching. The farmers on the better lands of the valleys and lowlands likewise felt the pressure of cheap western products but adjusted themselves to the new order by intensifying their agriculture. There are other factors also that led to the abandonment of farms. The railroads, when built in New England, avoided the hill lands. The more progressive of the young men and women left the isolated primitive rural districts for the greater opportunities and comforts to be found in the rapidly growing cities, and preferred to remain there. Many families, because of better wages in the factories, abandoned the farms, and many farms were lost on mortbages. The Civil War hastened the movement. Many families were broken up by the loss of the male workers. Some veterans purchased homesteads in the West. Prices of farm products were low and credit was difficult to secure. The abandonment of the hill farms is no more striking than the decadence of the hill towns; both are due to about the same causes.

Since probably as much as 75 per cent of the material of the drift has on the average not been moved more than 50 miles, it is the local bed rock that determines largely the mineral composition of the soil in any section. (See Fig. 65.) New England has little of the limestone and feldspathic rocks from which the best glacial soils are derived. The soil is everywhere made up mainly of crystalline material and is surprisingly

uniform over large areas, because there is great uniformity in the bed rock. In mechanical composition the soils vary from loam to stony loam. Scattered rocks and boulders of large size in many sections make the use of farm machinery difficult.

The rough topography and the thin soils of northern New England protected the forests here from the early onslaught experienced in those portions of the United States having good agricultural lands. New England, in the three centuries since the founding of Plymouth, has furnished pioneer farmers for the vast agricultural area to the west, from the Atlantic to the Pacific. Some have migrated three thousand miles, crossing deserts and mountain ranges, yet they are only now invading a

Photo by Parkins

FIG. 65.—Mantle Rock of Sand, Gravel, and Boulder in New England.

Soil derived from such material is typical in a large part of New England. Farms in New England were made by man and not by the Creator and they have left their imprint on the character of their makers. Burroughs says, "I much doubt whether the Western farms ever will lay the strong hands upon their possessors that our more varied and picturesque Eastern farms lay. Each field in these farms has a character of its own and the farms differ from one another as much as people do."

few of the northern valleys of New England with the plow. The lumberman still dominates the economic life of the north, and if a sensible forestry policy is followed he will continue to hold his own.

Glacial lakes are numbered by the thousands in New England. (Fig. 66.) There are probably more than one thousand in Connecticut, and an even greater number in Maine. Only a few are large enough to be shown on small-scale maps. Lakes add greatly to the scenic beauty of the landscape, are admirable natural reservoirs for municipal water supply, furnish sites for summer homes, are storage basins that serve to regulate the flow of streams, and are thus of particular benefit to factories using water power. (Fig. 67.)

Photo by Parkins.

FIG. 66.—A Landscape in Northern Vermont.

This is a typical glacial landscape of New England—hills, undrained depressions, marshes, lakes. Agriculture is possible on almost any of the slopes and flats in the section here shown.

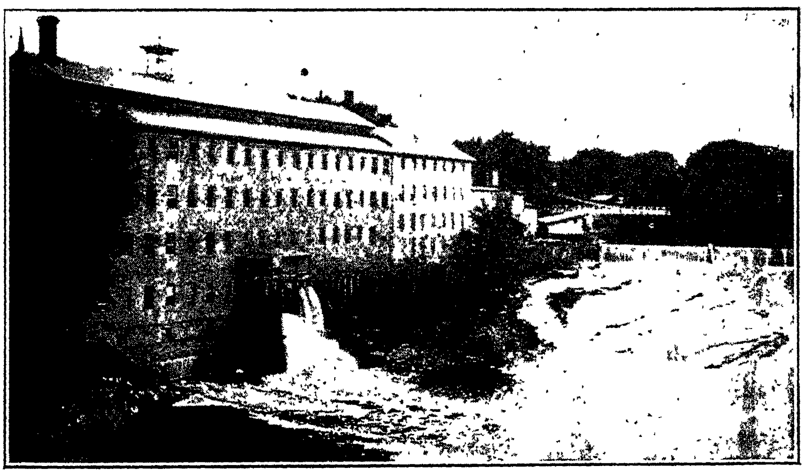


Photo by Parkins.

FIG. 67.—A Factory at Keesville, New York, Localized by Water Power.

Before railroad transportation made it possible for New England and New York to secure coal at a comparatively low price, factories sought waterpower sites on the numerous rivers. As larger plants and heavier machinery came to dominate in the industries there resulted a concentration of factories at the larger power sites. Later coal was used to supplement waterpower in the dry season. At present the power capacity of the installed water turbines in New England is greater than the potential power of the streams.

The sea interests have been benefited by glaciation, a partial compensation for the meager opportunities in agriculture. Ice scouring has been a factor in harbor making along the rocky coast from Salem northeastward, and the "Banks" of northeastern North America, thought to be due to glacial deposition, favor the fishing industry. The glaciers of the Ice Age, therefore, affected all the major economic interests of New England—agriculture, lumbering, fishing, manufacturing, and commerce.

The Adirondack Province.—Similar in many respects to northern New England in its physiographic conditions and economic interests is the Adirondack Province, an outlier of the Laurentian Plateau of Canada. The region long remained unsettled and little visited by whites, even after the surrounding lowlands had fine farms. But because of its proximity to the great cities to the south and to the long-traveled routes on the east, south, and west, and because of its wildness, beauty of scenery, and excellent fishing and hunting, it has become in recent decades a great playground. It can now be traversed along many routes; hotels and club houses are numerous; and there are many beautiful summer homes on large estates. Forests cover most of the surface and are held by large lumbering companies and hunting clubs, or by the state as forest reserves. The bed rock is largely crystalline limestone and several forms of granite. The whole was thoroughly glaciated, as the rounded surfaces, scoured basins and valleys, ice-molded hillocks, and morainic deposits show. There are a few high peaks, Mt. Marcy having an altitude of 5344 feet, and Whiteface about 4900.

Newer Appalachians.—In the Middle Atlantic States the newer Appalachians are represented by the Allegheny Plateau and the Great Appalachian Valley, and the older Appalachians by the Piedmont Plateau.

The Allegheny Plateau.—The Allegheny Plateau, the eastern edge of which is the Allegheny Front, varies in width from 125 to 200 miles. The western edge has no definite name, but is represented nearly everywhere by a low, yet distinct, escarpment from central Ohio northeastward, the location of which is indicated on Fig. 62.

The Catskill Mountains, overlooking the Hudson Valley, are on the dissected edge of the Plateau at its northeastern border. The horizontal stratified rocks—shale below, sandstone above, and conglomerate on the summits of many of the ridges and peaks—have many joints along which erosion has been rapid, giving rise to numerous valleys. Within the shales and sandstones there are rocks of varying hardness that outcrop along the valleys, and thus rapids are numerous in the channels of the streams, and ledges on the valley side. Not being suited to agricul-

ture, the region supports a scantier population than the nearby lowlands, but the beauty of the scenery and the proximity to New York City has brought a lucrative tourist and resort business in recent decades. One of the main ranges of the Catskills, a dissected ridge extending northwest and southeast, has a length of about 35 miles. The higher peaks vary in height from 3800 to 4200 feet.

The Allegheny Front sweeps across Pennsylvania from the southern boundary northeastward, in a broad curve as far as the forks of the Susquehanna. From there northeastward, its outline is not so regular. From the southern border to central Pennsylvania, the continuity of the Front is unbroken except by small stream valleys with separating spurs. Seen from the plains to the east, it looks like a serrated mountain ridge. It is still known to many as the Allegheny Mountains. The West Branch and the North Branch of the Susquehanna, as well as their tributaries, pierce the Front from central Pennsylvania eastward by deep, broad valleys, and it is along these valleys that the easiest routes to the plateau are found.

The surface of the plateau is thoroughly dissected, especially near the major drainage lines. Here the valleys are deep and the slopes so steep that many areas have been left in forest, or, if tilled, have suffered greatly from soil wash and gullying. On the large interstream areas, the land is gently rolling; such surfaces are found just west of the crest of the Allegheny Front. The rocks of the plateau lie practically horizontal or only gently warped, as in Chestnut Ridge and Laurel Hill in southwestern Pennsylvania.

The Great Appalachian Valley.—The Great Appalachian Valley is a series of limestone and shale plains separated by numerous, long, even-crested ridges that have in general a northeast-southwest trend, roughly paralleling the Allegheny Front and the western edge of the Piedmont Plateau. These ridges are composed of sandstone and conglomerate, the same formation occurring in several ridges. The strata in the ridges stand at a steep angle, showing that they are parts of great folds. The ridges are pierced at intervals by water gaps of streams that flow at right angles to their general trend. There are unbroken stretches of ridges of 20–40 miles, and some single ridges, like the Kittatinny Mountain, extends for 200–300 miles. This particular ridge was the first of the barriers to be met by the westward-moving settlers from Philadelphia in the early eighteenth century. Beyond this "Endless Mountain," the settlers on their way to western Pennsylvania met with many other barriers. Along the Pennsylvania Railroad from Harrisburg westward to the Allegheny Front west of Altoona, one may count ten or twelve separate ridges.

Some of the limestone plains of the Great Valley are almost entirely enclosed by ridges, the only low-gradient route for ingress and egress being along the drainage line. Such plains are known to physiographers as canoe-shaped valleys. Some of the ridges have a zig-zag course.

The eastern portion of the Great Appalachian Valley, lying to the southeast of the Kittatinny Mountain, is a long limestone lowland. In southern Pennsylvania and Maryland, it is called the Cumberland Valley; and in eastern Pennsylvania, the Lebanon Valley. It continues on northward to the St. Lawrence Lowlands. It is known as the Wallkill or Kittatinny Valley in northern New Jersey, and as the Hudson Valley and Champlain Lowland farther north.

The Great Valley throughout its extent in the Northeastern States offers excellent opportunities for agriculture, and where ready access is had to markets supports a dense rural population.

The Mohawk Depression.—Cutting across the Appalachian Highlands between the Adirondacks and the Allegheny Plateau is the Mohawk Valley, which connects the Hudson Valley with the eastern Lake section of the Central Lowland in western New York. This valley is a great thoroughfare between the Great Lakes and tidewater at Boston or New York, and is, like the New York–Philadelphia thoroughfare discussed previously, an inner lowland carved out of the softer strata that skirt the southern border of the Adirondacks. It is an area of prosperous farms and thriving cities and is traversed by hard-surface roads, the New York State Barge Canal, several railroads, and telegraph and telephone lines. It and the Hudson River Valley form the lowest route across the Appalachian Highlands, from the Canadian border to central Alabama. (Fig. 68.)

The Piedmont and the Various Prongs.—The Piedmont Plateau in Pennsylvania and New Jersey covers only a small area and is unlike the Piedmont in the Southern States in that metamorphosed igneous rock has a smaller surface exposure than sedimentary rocks. The Blue Ridge extends northward into southern Pennsylvania as a ridge, but dies out near Carlisle. This is known as the Carlisle Prong (South Mountain). In southeastern Pennsylvania the crystallines outcrop over a much larger area but terminate northward near the Delaware River at Trenton. This is called the Trenton Prong. A tongue of the crystallines of New England crosses the Hudson Valley to the north of the Palisades, in northern New Jersey, and extends into Pennsylvania in a narrow belt on to Reading. This is called the Reading Prong.

Between these prongs lies a lowland similar in geologic history, bed rock, and surface features to the Basin of Minas in Nova Scotia and the Connecticut Lowlands. The lowland of Pennsylvania is a repetition

of the lowland of Connecticut; drowning, and possibly some glacial erosion, has placed a portion of it beneath Long Island Sound; but in northern New Jersey its surface, as earlier shown, forms a part of the

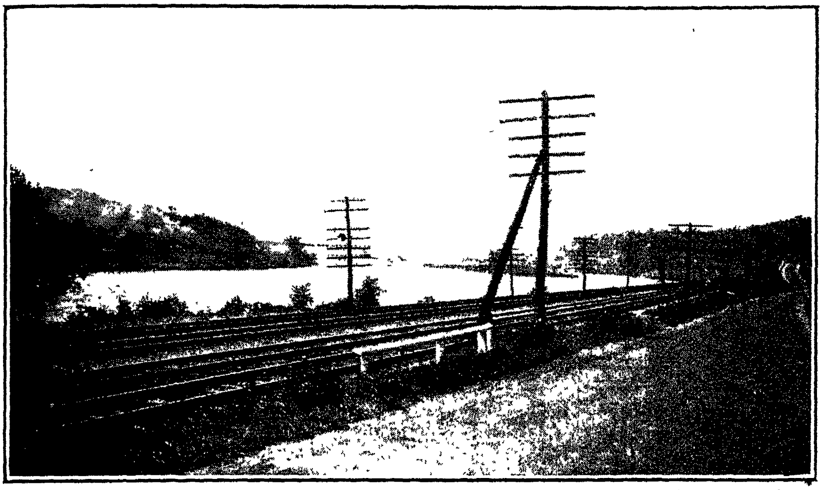


Photo by Parkins.

FIG. 68.—The Mohawk Depression as a Traffic Route.

In this picture one sees a hard-surfaced road, four railroad tracks (N. Y. C. R. R.), the Mohawk River (canalized in some sections), and the smoke from a locomotive on a railroad on the south side of the river (West Shore R. R.). In addition one sees 85 telegraph and telephone wires. The Mohawk route offers the lowest grades and altitude of any the passes across the Appalachian Highlands.

Inner Lowland. Trap ridges and isolated hills occur in the lowland of the Middle Atlantic States as in the Connecticut. The Palisades of the Hudson and the trap ridges of northern New Jersey and about Gettysburg represent the largest exposures of these igneous rocks. At Gettys-

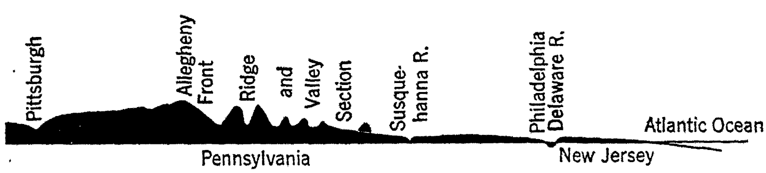


FIG. 69.—Profile of Land Features from Pittsburgh to Philadelphia.

Vertical scale about fifty times horizontal.

burg trap ridges and hills figured largely in the Union defences that broke the strength of Lee's invading army.

The sandstones and shales of the lowland in Pennsylvania were deposited in troughs in the Piedmont Plateau. These rocks weather

into a gravelly to sandy loam type of soil locally known as the Indian red soils. The Piedmont soils are known as "gray lands" and are quite distinct from the "red lands" of the lowland.

Within the Piedmont crystalline rocks in southeastern Pennsylvania, in Lancaster County, is a large area of limestone, similar in age to the limestones of the Great Appalachian Valley. (Figs. 69 and 70.)

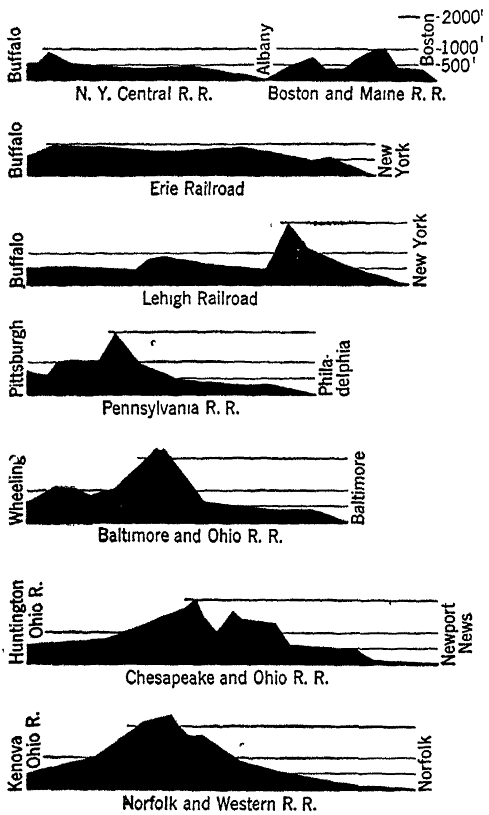


FIG. 70.—Profiles of Some Transappalachian Railroads.

(Vertical scale about 140 times the horizontal)

The New York Central route is far superior to the others in the adjustment to surface features. Between Albany and New York the route is practically at sea level.

Glaciation in Pennsylvania and New Jersey.—The effects of glaciation in Pennsylvania and New Jersey are not so far-reaching as in New York and New England, for only a small portion of these states was covered by ice. Long Island, as previously discussed, owes its surface features and soils to the ice work. A lobe pushed southward down the Hudson Valley to the south shore of Staten Island. Northeastern and northwestern Pennsylvania were ice-covered, as was all of New York except a small area about the headwaters of the Allegheny River, the higher lands of the Allegheny Plateau retarding the southward movement. The Adirondacks and the northern edge of the Allegheny Plateau in New York suffered great erosion. River channels in the edge of the plateau were widened and deepened into long, narrow lakes, the Finger Lakes. Numerous drumlins were deposited on the level lands to the north of these lakes, and, in the northward retreat of the ice front, a series of glacial lakes of large extent, antecedents of lakes Erie and

Ontario, were formed, so that the soil of much of northwestern New York is lacustrine (deposited in lake) in origin. In much of New York the glaciers worked on softer rock than in New England, and hence thin soils and bare ledges are less frequently met with, the Adirondacks and parts of the Catskills being exceptions.

EXERCISES AND PROBLEMS

1. It is the belief of geographers that New York has been greatly benefited in its growth in population, industries, foreign and domestic commerce, and business in general, in comparison with Boston and Philadelphia, by the closer contact it has with the great interior of our country. Show the truth or falsity of this belief. What is the physical basis of this easier contact? Work out graphs of population growth of these cities, of growth in foreign commerce, of railroad mileage, of manufactures. Data may be secured from the *Statistical Abstract*. Acquaint yourself also with the development of transportation lines to the interior. Which of these cities has the best local environment favoring growth? May not the difference in growth be due to the greater enterprise of the New Yorkers, past and present? Or is it a question of adjustment to opportunities? Is degree of enterprise a measure of the extent of natural opportunities with which man has had contact?

2. Where are the " playgrounds " of the Northeastern States? What physical features make them suited to such use and not to agriculture? Write to the various advertising bureaus of the railroads for booklets describing the attractions of the various " playgrounds." Try to determine what attractions are based on geography.

3. Compile a list of all the effects of glaciation on the economic, commercial, and social life of the people living in the glaciated portion of the Northeastern States.

4. The text states that a depression of the coastal regions of these states has been of great value to New York and Philadelphia as ports. What would have been the consequences if the coastal lands, instead of being depressed, had been elevated, say, about 400 feet above the present position?

CHAPTER V

AGRICULTURE IN THE NORTHEASTERN STATES

THE DEVELOPMENT OF AGRICULTURE

Agricultural Adjustments.—American agriculture, as practiced even to-day in the northern half of our country, owes much to the farmers of Colonial days and later. Along with the European colonists who founded Plymouth and New Amsterdam and the other colonies, came seeds and live stock and a knowledge of agricultural methods.

In the new environments in America, new adjustments had to be learned, and this is the problem that has ever been uppermost in the history of American agriculture. The fairly dependable oceanic climate of northwestern Europe offered few problems in crop adjustment to climate, in comparison with the fickle continental and littoral climate of northeastern United States. In the westward expansion of the agricultural frontier from the shores of the Atlantic, the farmers had to adapt their crops and methods of tillage to every grade of soil from gravelly and sandy to stiff clay, and to soils of every origin; to climates of the lowlands and of the highlands; to long growing seasons and short growing seasons; and in addition to constantly changing economic conditions as cities grew and transportation was improved. Naturally, they made many mistakes, but the trying conditions called for, and no doubt developed, ingenuity and adaptability, two cardinal virtues of American character.

Tillage was, for many decades, wasteful. New lands were constantly being opened up and there was thus no pressure on the farmers to utilize the agricultural resources of any field or any region to the utmost. Agriculture, for two centuries or more, was largely migratory in type; each farmer migrated from old communities to new, and he migrated with his tillage on his own farm from field to field. "Summer fallowing" was common, instead of a carefully thought-out scheme of crop rotation. On many farms, even the manures were not used.

For nearly two centuries there was little attempt to evolve new varieties of crops suited to American conditions, and there were, with the exception of corn, peas, beans, pumpkins, and the grape, no food

plants that had been developed from American plants. Native grasses have been utilized for fodder. Flint claims that the extensive and practical cultivation of natural grasses originated in North America, or at least was introduced here long before it was in England. Fortunately for the experimenters, this development took place in the hay and fodder region where conditions are most favorable. Timothy is an American grass, so named for Timothy Hanson, who was much interested in its propagation and who took seeds of this grass from New York to the Carolinas and even to England.

Not until improved transportation broadened the markets for the farmers and the commercial régime was ushered in, was there a change from general cropping. Each community produced, for the most part, all the crops it needed, rather than crops that represented climatic and soil adjustment.

The Evolution of Agricultural Implements and Machines.—The implements of Colonial days were crude, handmade, and mostly of wood. The early plows, which were of wood, merely "disturbed" the soil and did not turn it over. The first farming in the Massachusetts Bay colonies, as in the other settlements, was largely "planting" and not real agriculture, for there were not enough plows to go around. In 1637, it is reported, these colonies had only thirty-seven plows. The owners of the plows did plowing for others and often went long distances from home. To encourage ownership of this useful implement, a bounty for a time was paid. Some of the plows were huge affairs requiring three men and four yoke of oxen to operate them. By 1814 the plow began to take on its modern form. John Deere made his first steel plow in 1837.

The agricultural machinery age in the United States began about 1830. For several decades nearly all the patents granted were taken out by men from the Northeastern States, and nearly all the agricultural-implement factories were in these states, no doubt a response to the rapid expansion of the farm area by the opening of the Middle West and the creation of a shortage of farm labor. The cradle was invented in New England in 1806. In 1831 William Manning of New Jersey was granted a patent for a mower. Obed Hussey of Baltimore received a patent on a reaper, in 1833, in which the principles of the mower were embodied, and the next year Cyrus McCormick, in the nearby state of Virginia, received his patent. The reaper was little used, however, until after 1840 or 1850. Threshing machines in the 1830's began to replace the flail or the tramping horses or cattle. At first the threshing machines only separated the grain from the straw, and winnowing had to be done by means of a sheet or blanket in a strong wind. A separator was devised in 1850, and the steam thresher by 1860. By 1865 many farms

were equipped with the steel plow, toothed harrows, a mower and horse rake, a grain drill, and a reaper. The threshing was done by a steam thresher owned by a professional thresher who did the " jobs " for many communities.

In recent decades the Northeastern States have not kept pace with other sections of the country in the percentage growth in value of farm machinery. The increase in New England was 82 per cent from 1910 to 1920; in the South Atlantic States, 189 per cent; in the East North Central, 192 per cent; and in the Mountain States, 286 per cent. This slow growth is due largely to the increased attention given to dairying and gardening.

The Live Stock Industry in the Northeastern States.—In Colonial days the Northeastern section had many breeds of cattle, each colony having imported its own special favorites from its own Mother Country. There were breeds from Holland, Scotland, England, Sweden, and Denmark. Cattle were brought from England to Plymouth in 1624. In the selection of sites for new settlements, the presence of land suitable for cow pastures was an important item. The marshlands along the coast, and those of the filled glacial lakes, fed many herds.

There were really no pure breeds at this time, for scientific breeding was unknown even in Europe. Each county or region developed a strain peculiar to itself, in most cases the result of accidental rather than artificial selection. In most parts of the Northeastern States, oxen were used quite generally on the farms until about 1840. On the hill farms of New England they were in favor much later, as they were cheaper than horses and thrived better on the sparse grass of the hills. The building of turnpikes and the introduction of agricultural machinery made a demand for a much speedier animal and the horse came into general demand.

The Dominance of Dairying To-day.—Most of the herds of the Northeastern States to-day—4,800,000 out of a total of 5,189,000 in 1920—are dairy cattle. (Fig. 71.) Commercial dairying began even before the Revolutionary War. Near some of the cities there were herds of 50–100 cows or more; with increasing urban population and improved transportation, the dairy farms increased in number. Farms within 100–200 miles of the cities now furnish milk and cream, generally through milk dealers who sterilize, bottle, and distribute the product in the cities. Along some railroads, milk express trains are

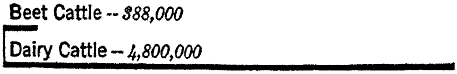


FIG. 71.—Cattle on Farms in the Northeastern States, 1920.

The dominance of dairy cattle is an evidence of intensification in cattle raising.

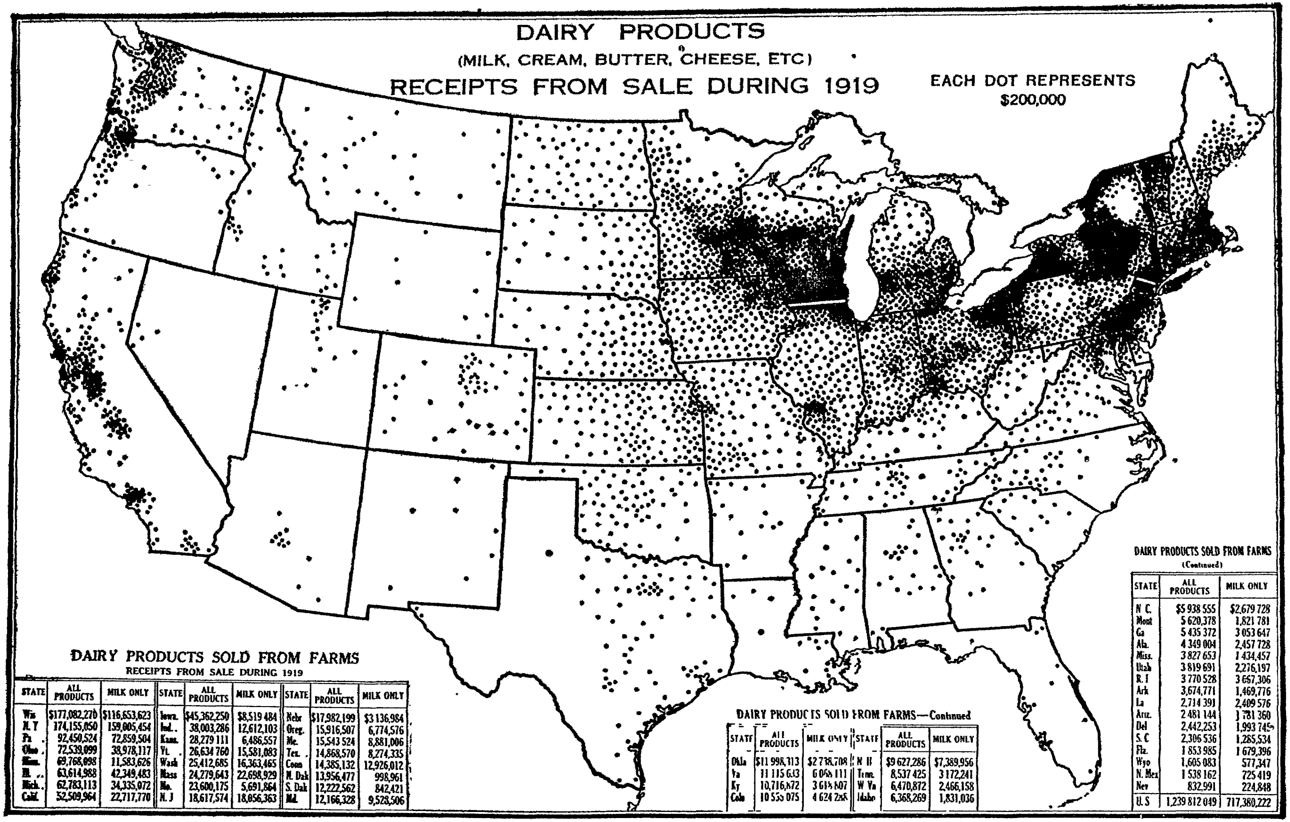
run. The electric cars, and in late decades auto trucks, are prominent in this transportation. In the parts of these states beyond the five- to eight-hour run to some city, creameries and cheese factories are turning the raw product of the dairies into butter, cheese, and even condensed milk—more concentrated and less perishable forms than the sweet or raw milk. (Fig. 72.)

Dairying will continue to be an important type of farming in the Northeastern States, and must increase. As a result of "better babies" campaigns and health campaigns, the per capita milk consumption is increasing. Nearly 75 per cent of the population of the Middle Atlantic States and 80 per cent of that of New England lived in the cities in 1920, and the urban population is increasing. Milk production must increase, therefore, within the sustenance area of the large cities. This may be accomplished by an expansion of the area devoted to dairying, by extending the radius from which milk is now drawn, by speedier transportation facilities, and by the selection of better breeds of dairy cattle. Little attention has been paid to date to the selection of pure-bred dairy cattle. In 1920 only 325,000 out of the 4,800,000 dairy cattle were pure-bred.

On some dairy farms, only the roughage is raised, the concentrated foods being imported from the grain-growing states of the Middle West. This practice may be extended. Many pastures are not now producing the maximum of fodder because of continued cropping. Some pastures have been grazed continuously, it is claimed, for more than a century. Many could be improved by selecting a better variety of grass. (Fig. 73.)

A special type of dairy farming is to be found in some parts of the Northeastern States—the preparation of certified milk, often prescribed by physicians for delicate babies and even for mature invalids. There is a very limited market for this product, yet undoubtedly the profits are greater in its preparation than in the production of the common sort of milk. The dairy equipment is costly, for great care must be exercised in making and keeping the milk pure and clean.

Celebrated Breeds of Horses.—The Northeastern States have produced many celebrated breeds of horses. Just before the Revolutionary War, a small, hardy saddle horse, the Narragansett pacer, was developed in Rhode Island and sent to the West Indies and the Southern Colonies for the use of overseers and owners of plantations. It is believed that the sire of the breed was imported from Spain. By 1800 the stock had disappeared in New England. The Morgan horse, a well-known breed, was developed in Vermont. The Conestogas of Pennsylvania, before the days of canals and railroads, were famous as



DAIRY PRODUCTS SOLD FROM FARMS
RECEIPTS FROM SALE DURING 1919

STATE	ALL PRODUCTS	MILK ONLY	STATE	ALL PRODUCTS	MILK ONLY	STATE	ALL PRODUCTS	MILK ONLY
Wis	$177,082,270	$116,653,623	Iowa.	$45,362,250	$8,519 484	Nebr	$17,982,199	$3 136,984
N. Y	174,155,050	159,005,454	Ind. .	38,003,286	12,612,103	Oreg.	15,916,507	6,774,576
Pa .	92,450,524	72,859,504	Kans.	28,279 111	6,486,557	Me.	15,543 524	8,881,006
Ohio .	72,539,099	38,978,117	Vt. .	26,634 760	15,581,083	Tex. .	14,868,570	8,274,335
Minn.	69,768,098	11,583,626	Wash	25,412,685	16,363,465	Conn	14,385,132	12,926,012
Ill. .	63,614,988	42,349,483	Mass	24,279,643	22,698,929	N. Dak	13,956,477	998,961
Mich. .	62,783,113	34,335,072	Mo.	23,600,175	5,691,864	S. Dak	12,222,562	842,421
Calif.	52,509,964	22,717,770	N. J	18,617,574	18,056,363	Md.	12,166,328	9,523,506

DAIRY PRODUCTS SOLD FROM FARMS—Continued

STATE	ALL PRODUCTS	MILK ONLY	STATE	ALL PRODUCTS	MILK ONLY
Okla	$11 998,313	$2 738,708	N H	$9 627,286	$7,389,956
Va	11 115 633	6 066 111	Tenn.	8,537 425	3 172,241
Ky	10,716,872	3 618 807	W Va	6,470,872	2,466,158
Colo	10 555 075	4 624 288	Idaho	6,368,269	1,831,036

DAIRY PRODUCTS SOLD FROM FARMS
(Continued)

STATE	ALL PRODUCTS	MILK ONLY
N C.	$5 938 555	$2,679 728
Mont	5 620,378	1,821 781
Ga	5 435 372	3 053 647
Ala.	4 349 004	2,457 728
Miss.	3 827 653	1 434,457
Utah	3 819 691	2,276,197
R. I	3 770 528	3 667,306
Ark	3,674,771	1,469,776
La	2,714 391	2,409 576
Ariz.	2 481 144	1 781 360
Del	2,442,253	1,993 745
S. C	2,306 536	1,285,534
Fla.	1 853 985	1 679,396
Wyo	1,605 083	577,347
N. Mex	1 538 162	725 419
Nev	832,991	224,848
U. S	1,239 812 049	717,380,222

Courtesy U. S Department of Agriculture.

Fig. 72.

New York and Pennsylvania were the greatest dairy states for many decades. Wisconsin now leads New York in the number of dairy cows and value of product sold from the farms. Even Minnesota surpasses New York in the number of cows, but is far below that state in value of product.

freighters, being good walkers and draft horses with great endurance. They probably came from a breed imported from Flanders. The breeding of "special purpose" horses began about 1800. The era of turnpikes increased the demand for horses. While the railroad displaced the horse in long-haul traffic, it so stimulated industries of all sorts that the horse breeders for many decades found a ready market for their product in both the country and the city. Within the last few decades the gasoline car has replaced the horse to such a degree that one may travel a thousand miles along the smooth-surfaced roads and meet no more than a half dozen horse-drawn vehicles. On the small and less

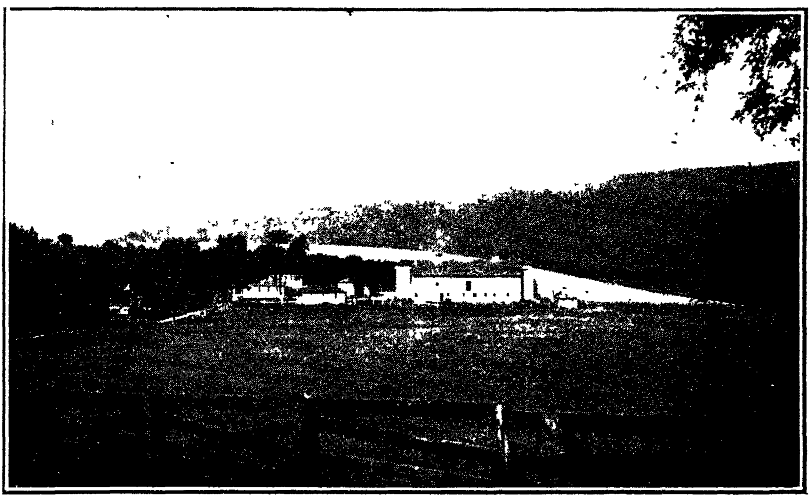


Photo by Parkins.

FIG. 73.—A Dairy Farm Typical of the Ridge and Valley Section of Maryland.

The valleys are as a rule underlain with limestone, the ridges are of more resistant rock. Dairying and fruit raising are the intensive phases of agriculture practiced here.

productive farms of the Northeastern States, however, the horse will not be so readily displaced as in the Middle West.

The Sheep Industry of the Northeastern States.—On January 1, 1920, there were some 35,000,000 sheep in the United States, but only 242,000 in New England and less than 1,100,000 in the Middle Atlantic States. From 1910 to 1920 the sheep of New England declined from 431,000 to 242,000. There was a time when a sheep was considered a necessary animal on most farms, the wool being in demand for the making of clothing. Since 1800 the number has declined. Many breeds have been imported and tried. The Leicester, which originated in England in 1755, was one of the earliest to be tried out, but it did not

become popular in New England until about 1860. The first Merinos were brought from Spain to Massachusetts about 1801. Because of their fine wool they were in much demand, and by 1811 nearly 20,000 had been introduced. Western wool, however, brought about a decline in the number of Merinos in the Northeastern States. The Dorset, a mutton variety, is now in favor with sheep raisers who specialize in the production of " hot house " lambs. The lambs, born early in the winter, are fattened by forced feeding and extra care and are ready for market in sixty days.

The increasing density of population and the intensification of agriculture do not necessarily mean the passing of the sheep industry from the Northeastern States, for Great Britain has more than 380 sheep to 100 cattle, in comparison with about 75 sheep to 100 cattle in the Northeastern States. If sheep raising has a place in the farm economy of England, where manufacturing so completely dominates the activities of man, it certainly has a place on the farms of the Northeastern States. Sheep raising primarily for wool is a thing of the past; but the production of mutton with wool as a by-product should prove profitable, although Americans are not mutton eaters to the extent that the English are. The stony hillsides of the Northeastern States may well be utilized for sheep raising. Large-scale production will undoubtedly prove most profitable. Abandoned farms of the hill lands may be combined, and large ranges thus provided. The production of " hot house " lambs is another intensive form of the industry. There are still many sheep breeders' associations in the East and the interest in sheep raising is increasing.

Contributions to Fruit Growing.—Europe furnished America its first apple, pear, and peach trees, and the first of other varieties of fruit; yet the orchard fruits of to-day are more distinctly American creations than are the many grains and vegetables discussed elsewhere in this chapter, for the transplanted fruit has been modified in the new environment and hundreds of entirely new varieties have been developed. Eliot, the first American author on horticulture, writing about 1759, says in the quaint English of his time as to early horticulture, " There are sundry books on husbandry wrote in England, . . . yet such is the difference of the climate and Methods of Management between them and us, arising from Causes that must make them always differ, . . . that those Books are not very useful to us."

The first orchard of New England was on Governor's Island in Boston Harbor, from which there were picked on October 10, 1639 "ten fair pippins." In a book of a later time we read, " The country is resplendent with fair and large orchards." Salem had an apple-tree nursery in 1640.

From eastern Massachusetts, seeds or nursery products were carried by Indians and whites to other parts of New England and even New York. In western New York, the earliest apples were probably grown from seed brought by the Jesuits. The propagation of orchard fruits has always been an important work of farmers and nurserymen. A farm with a valuable orchard was much prized, and no farm was complete unless it had an orchard. A knowledge of fruit tree propagating and grafting was one of the many accomplishments of most of the ingenious New England and New York farmers. Most of the apples in Colonial days were raised for cider, immense quantities of which were produced. One chronicle says that forty families in a small town near Boston made 3000 barrels of cider. One apple enthusiast declared that "he had made 500 hogsheads of Syder out of his own orchard in one year."

There were then, as now, various methods of securing new varieties in nursery stock. Seeds were often planted, and, if the resulting plant was not "true," it was grafted with the true variety. Apple trees were occasionally found in the forests, the seeds having been dispersed by birds, man, or other means. Some of these escaped trees became the parents or furnished scions of new varieties. The Baldwin, one of America's most popular apples, was discovered in 1793 near Lowell, Massachusetts. The McIntosh Red was discovered in 1796. Mr. McIntosh discovered, in clearing the forest for crops, a clump of about twenty small apple trees. These he transplanted, and eventually all of them died but one. This tree, because of the beautiful color and excellent flavor of its fruit, produced many scions for budding and shoots for grafting, and continued to bear until 1908. The Northern Spy originated in Bloomfield, New York, in 1800; and the Primate, in Onondaga County, about 1840. Many of the apples of the Northeastern States have become so famous that monuments have been erected to them on the site of the parent trees. There are probably one thousand varieties of apples in the United States to-day, nearly all of which have originated in America and a large majority of these in the Northeastern States.

Apples, for the first century or two in America, were raised chiefly for cider, as we have seen, and for fresh fruit. Their storage in bins and root-houses extended the season of consumption. There was little commerce in them, because of poor transportation. Improved transportation gave growers a market and made apple growing profitable. For a time there was a boom in many parts of these states in apple growing; but overplanting glutted the markets, some investments failed to pay, and orchards were cut down to make way for other crops or were allowed to grow on neglected. Only those sections with best transpor-

geographic conditions so favorable for the eastern growers, markets near, and excellent transportation facilities to these markets, it is surprising that western-grown apples can be sold on eastern markets while thousands of bushels of eastern apples of commercial quality rot in the orchards. The West has one great advantage in the relative ease with which diseases and pests are controlled, the great distances between the irrigated oases tending to check migration. But a 2000-mile freight bill must reduce materially the returns to the Westerner. The success of the western grower undoubtedly lies more in the methods of marketing than in any geographic factors. In the West, in the Yakima and Hood River Valleys, for example, the apple is the leading money crop, while in the East it is the chief crop on only a few farms. Should the East in the future take advantage of its favored location and climate and adopt better marketing methods, it is difficult to see how the West can maintain a place in eastern markets for its apples.

The Peach-growing Industry.—Peach trees, because of their more delicate response to spring heat and their sensitiveness to winter cold, are restricted in their distribution to sections where early budding is prevented or where air drainage tends to reduce the damage from late frosts, and where the winter temperatures are moderate. Western New York near Lake Ontario, from the standpoint of production per square mile, is the leading peach-growing section of these states. Extreme winter temperatures and the high range of spring temperatures make peach growing unprofitable in the northern parts of these states and the highlands of Pennsylvania. Since nearly 80 per cent of the peaches (1919) of the United States are grown south of the Mason and Dixon Line and in California, it is evident that the peach is a crop for sections that have warmer temperatures than most parts of these states. Pennsylvania, among the Northeastern States, leads (1919) in the number of bearing peach trees, with New York second; and New Jersey leads in the production, with New York second. The New England States produced only 479,000 bushels in comparison with 4,000,000 bushels in the Middle Atlantic States and 51,000,000 bushels in the United States.

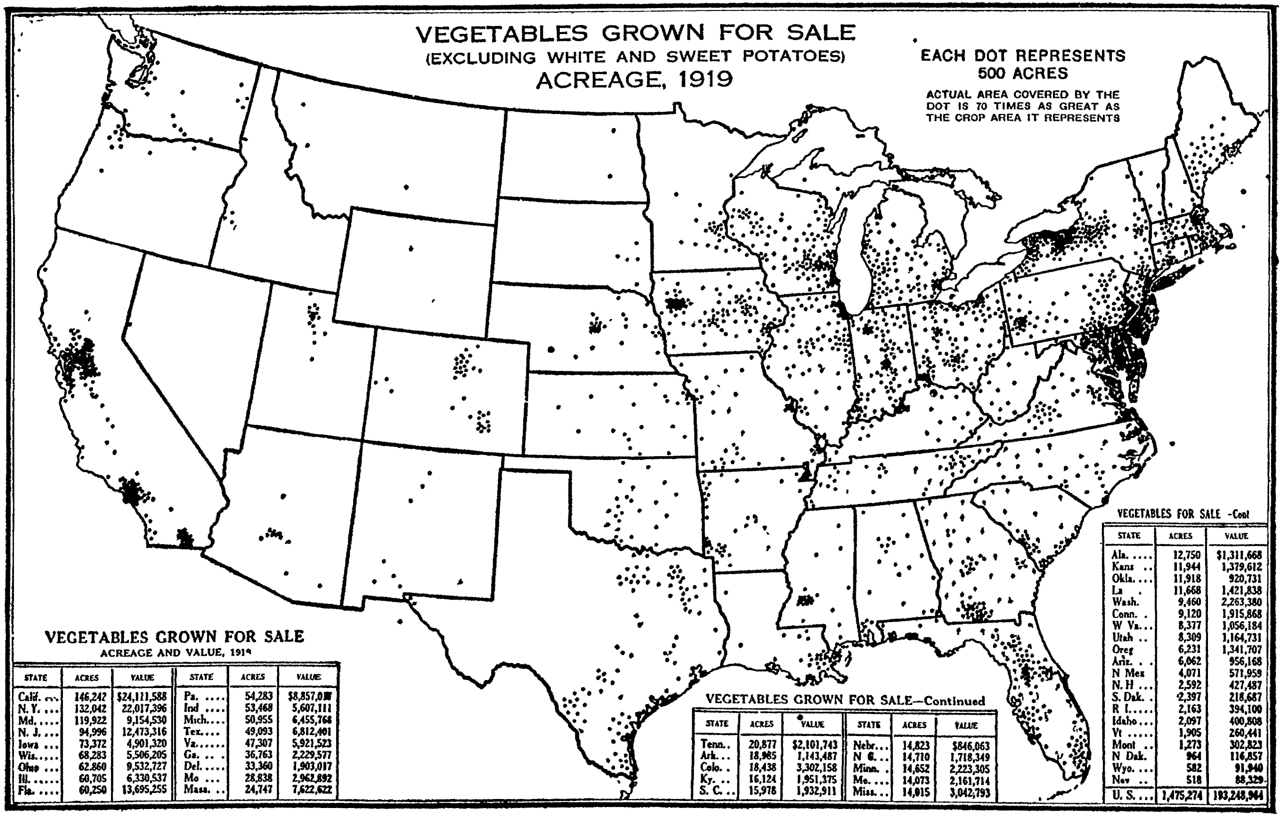
The apple and peach regions also produce pears, cherries, bush fruits, and strawberries. New York stood second in 1919 to California, the leading pear-producing state, northwestern and eastern New York being the leading sections.

Rank in Grape Growing.—Although the 152,000,000 pounds of grapes, the production of New York in 1919, was small in comparison with the 2,000,000,000 pounds of California, New York is the leading grape-producing state east of the Pacific Slope. The southern shore of Lake Erie in both New York and Pennsylvania and the slopes about the

Finger Lakes of central New York produce more than 95 per cent of the output of the vineyards of the Northeastern States. This shows the strong influence of bodies of water in the localization of grape culture. The grape of the United States, except the varieties grown in California which are from the European *vinifera*, is an American product. During the era of agricultural experimentation which characterized the Colonial Period, the European grape was tested out, but fungus and the insect phylloxera blighted all attempts, and the grape enthusiasts were forced to develop the wild grape of the forests which was indigenous to a moist climate. The grape in Europe grows on well-drained soils or in regions of summer drought. The first well-known American grape developed was the Catawba. Its history began about 1802. The Concord was evolved in 1849. The names Niagara, Concord, Early Ohio, Delaware, and others attest to the American origin of the grapes grown in eastern United States.

The Development of Gardening.—Practically all the vegetables now grown in our truck gardens were also grown in Colonial days from seeds imported from Europe. Among the many imported plants, as listed in a book on gardening published about 1650, were the following: cabbage, lettuce, parsley, sage, carrots, beets, radishes, peas, beans, asparagus, cucumbers, muskmelon, spearmint, and thyme. The Indians were raising beans, peas, melons, and pumpkins when the Europeans reached North America. These were probably developed from wild plants. From both of these sources, American and European, plant breeders developed a large number of varieties that are adapted to various forms of home gardening and commercial truck gardening and to the different climates found in America and the various tastes or whims of consumers.

A garden, like an orchard, has always been considered a necessity on most farms in these states. Not until the rise of the manufacturing city did commercial truck gardening become an important industry. In 1919 the Northeastern States offered for sale $56,000,000 worth of vegetables, or more than one-fourth of the total for the United States. (Fig. 75.) New York stood a close second to California, the leading state; and New Jersey stood second to Florida, the third state in rank in truck-garden products offered for sale. Commercial gardening to-day is stimulated by the excellent markets offered by the numerous large cities. About every city there are market gardens, well-drained sandy land being much preferred because it is more easily worked and is warmer, and therefore matures plants more rapidly, than heavier soils. The terrace lands of the Connecticut, the outwash plains of Long Island, and the sandy lands of the Coastal Plains are the leading truck-



VEGETABLES GROWN FOR SALE
ACREAGE AND VALUE, 1919

STATE	ACRES	VALUE	STATE	ACRES	VALUE
Calif.	146,242	$24,111,588	Pa.	54,283	$8,857,0[illegible]
N. Y.	132,042	22,017,396	Ind	53,468	5,607,111
Md.	119,922	9,154,530	Mich.	50,955	6,455,768
N. J.	94,996	12,473,316	Tex.	49,093	6,812,401
Iowa	73,372	4,901,320	Va.	47,307	5,921,523
Wis.	68,283	5,506,205	Ga.	36,763	2,229,577
Ohio	62,860	9,532,727	Del.	33,360	1,903,017
Ill.	60,705	6,330,537	Mo	28,838	2,962,892
Fla.	60,250	13,695,255	Mass. ..	24,747	7,622,622

VEGETABLES GROWN FOR SALE—Continued

STATE	ACRES	VALUE	STATE	ACRES	VALUE
Tenn. .	20,877	$2,101,743	Nebr. ...	14,823	$846,063
Ark. ..	18,985	1,143,487	N C. ...	14,710	1,718,349
Colo. .	18,438	3,302,158	Minn. .	14,652	2,223,305
Ky. ..	16,124	1,951,375	Me. ...	14,073	2,161,714
S. C. ..	15,978	1,932,911	Miss. ..	14,015	3,042,793

VEGETABLES FOR SALE -Cont

STATE	ACRES	VALUE
Ala.	12,750	$1,311,668
Kans ..	11,944	1,379,612
Okla. ...	11,918	920,731
La .	11,668	1,421,838
Wash.	9,460	2,263,380
Conn. .	9,120	1,915,868
W Va. ..	8,377	1,056,184
Utah ..	8,309	1,164,731
Oreg	6,231	1,341,707
Ariz. . .	6,062	956,168
N Mex	4,071	571,959
N. H ...	2,592	427,487
S. Dak. .	2,397	218,687
R I.	2,163	394,100
Idaho ...	2,097	400,808
Vt	1,905	260,441
Mont ..	1,273	302,823
N Dak.	964	116,857
Wyo. ...	582	91,940
Nev ..	518	88,329
U. S. ...	1,475,274	193,248,964

Courtesy U. S. Department of Agriculture.

FIG. 75.

The numerous industrial cities of the Northeastern States afford excellent markets to the commercial vegetable grower. The particular localization on Long Island, in New Jersey and Maryland and Virginia (latter two are Southern States) is largely a response to light soils. The gardens in northwestern New York are on the lacustrine plains and in the fruit regions.

garden areas. There are few other sections of the world where truck gardening has been intensified to such a degree as in parts of these states. Cold frames, hot beds, and greenhouses are common equipment in many parts. The greenhouse makes year-round production possible. The average yield per acre of truck-garden produce in the State of Massachusetts, in 1919, was $308, the highest for any of the states.

Potato growing is practiced in many parts of these states other than Maine. New York is the leading potato state in our country.

The Northeastern States in Comparison with Other Sections.—Northeastern United States is usually thought of as a great manufacturing region. Elsewhere it is shown that although this section is not a great agricultural region, in comparison with the North Central States or the South, it holds an important place in the history of American agriculture because it was for two centuries or more the experimental area for a good part of the nation, for garden, orchard, and field crops imported from Europe. In statistical comparison made with other sections of the country—North Central, South, and West—involving totals for these sections, the Northeastern States often show up poorly. This is chiefly because of the small area of these states. New England occupies only 2.2 per cent of the total area of the country; the Middle Atlantic States, 3.4 per cent; and both only 5.6 per cent in comparison with 25.3 per cent for the North Central group, 29.8 per cent for the South, and 39.3 per cent for the West. Although the density of population of this group of states is far greater than that of other major groups—119.4 in 1919 for New England, and 222.6 for the Middle Atlantic States—only 28.1 per cent of the total population of the country live in northeastern United States, in comparison with 31.3 per cent in the South, and 32.2 per cent in the North Central area. Another fact should not be lost sight of in comparing the agricultural activities of various sections: only a small part of the population of many of these states is engaged in agricultural production. In 1920 only 2.5 per cent of the population of Rhode Island was rural, 5.2 per cent of Massachusetts, 17.3 per cent of New York, 21.6 of New Jersey, 32.2 of Connecticut, 35.7 per cent of Pennsylvania, 36.9 per cent of New Hampshire, and 61–69 of Maine and Vermont. Only one-fifth of the population of New England, and one-fourth of that of the Middle Atlantic States, lives in the rural sections. When these facts are given their full consideration, it is easy to show that the northeastern region, besides being the greatest manufacturing section of the United States, ranks exceedingly high in agriculture. This section, which has only 5.6 per cent of the area and 14 per cent of the rural population of the United States, produced, in 1919, about 8 per cent of all the farm crops, 29 per cent of

the truck-garden vegetables (in value), 26 per cent of the small fruits (in value), and 18 per cent of the orchard fruits (in bushels) of the United States. It has 13 per cent of the acreage of hay and forage of the country, 9.4 per cent of the live stock on farms, about 15 per cent of the dairy cattle, and about 12 per cent of the pure-bred cattle. And yet only 15.4 per cent of the total area of New England, and 41.5 per cent of the Middle Atlantic States, is improved farm land. Evidently the farmers of this section of the United States are contributing their quota and more to the meeting of the demands the nation makes on the holders and operators of the soil. (Figs. 76 and 77 show that the area of improved land is declining.)

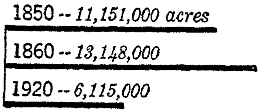


FIG. 76.—Improved Land in Farms, New England.

From 1850 to 1860 there was a slight advance in the expansion of improved agricultural lands, but in the sixty years since the latter date the area has shrunken to 46.5 per cent of the area in 1860.

Agriculture to-day in many parts of the Northeastern States is in the intensive stage, as previously suggested, yet only a beginning has been made in intensification. Intensive agriculture, fully developed, means the continuous use of the soil during the growing season, the growing of high-profit yielding crops, the employment of labor the year round, and a handling of the soil such that there will be no depletion. Intensification at present, in most of these states, is represented by the production of special crops or products, as orchard fruits, garden truck, small fruits, tobacco, potatoes, onions, cranberries, and dairy products. In only a few of these have the farmers an appreciation of the degree to which intensification may be carried. In the production of orchard fruits and the marketing of the products, the eastern farmer has much to learn from the West. Much of the truck gardening is little more than single-crop farming, with little appreciation of the need of a carefully thought-out rotation scheme. Commercial fertilizer which will in a few years make the soil acid is used in great quantities. Only by the application of humus-making fertilizers, such as may be obtained from dairy farms,

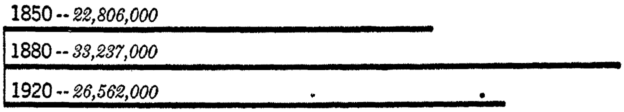


FIG. 77.—Improved Land in Farms in New York, Pennsylvania, and New Jersey.

The area of improved agricultural land in the Middle Atlantic States reached its maximum in 1880, about twenty years after the time of the maximum area in New England.

can the fertility be maintained. Dairying, although not using the land to produce the most profitable crops, is an all-year-round industry. As carried on in most parts of these states, it depends upon the grain states for its concentrated foods. Undoubtedly, the ideal intensive agricultural unit is the farm of general or diversified agriculture, an early type, which is represented by the agriculture of Lancaster County, Pennsylvania.

SELECTED TYPE AREAS

Agricultural Adjustments in Plymouth County, Mass.

It is fitting that we begin the study of agricultural types in the Northeastern States with a consideration of the oldest farming section of the North, Plymouth County. Here on the shore of Cape Cod Bay, the Pilgrims landed in December, 1620. The next spring they began the planting of maize in small plots which the Indians had used for this pioneer cereal. Maize soon became the staple crop. In addition to supplying the needs of the colony, it was sold to the fishing villages up and down the coast. Wheat also was sown, and likewise a variety of vegetables. As time went on, horses, cattle, sheep, and hogs were introduced, and thus was established one of the nuclei of the live stock industry of the North.

Selection of Lands.—To the little agricultural settlement on the shores of Cape Cod Bay, as population increased by natural increment and by immigration, lands were added and the pioneers began in earnest their conquest of an inhospitable agricultural environment. For the most part, only the best lands were used. Areas of thin soil, sandy ridges, mucky or boggy lands were left in their natural state. On the better lands, forests of white pine, oak, beech, maple, hemlock, and other trees had to be removed, and some farms literally reclaimed by the removal of tons of erratic boulders per acre.

The conditions that prevailed in Plymouth County are fairly typical of many parts of the Northeastern States; yet under these seemingly adverse conditions has developed an honest, upright, enterprising, painstaking type of citizen to whom credit must be given for most of the great progress that has been made in agriculture, and in other fields as well, in the North from New England to the Pacific. Burroughs has well said, "A granite soil should grow a better crop of men than the silt of lake or river bottom, though it yields less corn to the acre." Speaking of the Northeastern States he says, "Every field in these farms differs from one another as much as people do. An East-

ern farm is the place for a home; the Western farm is the place to grow wheat, pork, and beef. . . . How can the rural virtues of contentment and domesticity thrive there (in the Middle West)?" The New England environment has put its stamp on the people who have labored long and honestly to gain a livelihood. The New Englander of the old school may have been provincial and conservative, but he was the sort needed to give solidarity to a developing civilization in the American environment, most phases of which tend toward economic superficiality in the development of the resources.

Farm Activities.—The early New England family was large, often numbering a dozen or more. The necessity of feeding and clothing so many persons, coupled with the shortness of the growing season, the climatic limitations for many crops, and the patchy distribution of the deep soils on most farms, forced the head of the family, as well as the mother and older children, into habits of work and economy. Each household was an economic unit in which farm implements, furniture, and clothing were manufactured during the long winter months. Leather was tanned, cut, and sewed into harness, shoes, and boots. Many houses had forges and anvils near the chimneys at which iron was heated and hammered into nails, runners for sleighs, tires for wheels and straps for plows. Clothing was made from wool, grown, spun, and woven at home. Such conditions no doubt tended to develop the mechanical ingenuity that is characteristic of so many Americans, and aided greatly in the development of manufacturing in New England at a later date.

The fields were planted or sown mostly to supply crops. Gardens and orchards of apples, pears, and cherries were planted on nearly every farm. The system of tillage was similar to that prevalent in England at that time, and this system continued in use down to the middle of the nineteenth century. Indeed many of the farms of Plymouth County remained in possession of descendants of the original families until that date. Until the coming of the railroad about 1840, when access was had to the growing industrial centers, there was little to force the farmers to change from this system of general farming to special crops and intensification. Migration to the better agricultural sections of Lake States and the constant drift to the cities, as they expanded in industries and trade, kept the rural population nearly stationary in density. The great age of the communities, the meager though sufficient returns from the lands, and the constant migration of the younger and more venturesome and progressive from the farm kept the rural people conservative. There is nothing quite so fixed as an agricultural community after it has once reached the limits of its areal expansion of cultivated lands and its markets have become fixed.

Some Economic Adjustments.—The growth of cities made increasing demands for agricultural products, but the urban population was small in comparison with the rural. In 1700 Boston had a population of about 7000 while the population of New England was 105,000. By 1763, when New England had grown to 510,000 people, Boston's population was between 15,000 and 20,000 and there were few other urban groups. Poor roads restricted the sustenance area of the cities to lands within a 40- or 50-mile radius. Coast towns, however, had much larger commercial areas.

From 1840 to 1860 was a prosperous period for the farmers of Plymouth County and other parts of New England. The railroads opened up new markets, but new dangers arose. Gradually there came an increasing flood of products from the rich plains of the Middle West, as railroads reached farther west. These came to compete with those raised with much toil on the scanty, patchy soils that had already been producing for a century or two. The railroads also expanded the markets for the manufactures of New England, the factories grew in size and multiplied in number, and the drift of laborers to the cities increased. Many farms were abandoned outright; others were unworked. In 1880 there were 86,000 acres of improved land in Plymouth County, Mass., out of a total of 194,787 acres of farm lands; but in 1910 there were only 50,200 acres improved and 137,000 acres in farms. Figure 76 shows the change in acreage in improved farm land since 1850 and 1860.

During the last two or more decades many farms have been purchased as country homes, the suburban trains and the automobile making it possible for the office man to live 25, 50, or more miles from his work. Some farmers, who were more adaptable to changing conditions than others and were able to weather the adverse times and hold on, have enlarged their acreage by purchase of adjoining farms; yet in many parts of the country farms have been divided into 10–15 acre plots and sold to European immigrants who grow berries, poultry, and garden truck by intensive methods, the women and children furnishing most of the labor, although the man of the family, who generally is a factory worker, assists at spare times. Now there are few abandoned farms to be found in this part of New England. One finds, on all the better soils, well-kept farms that have an air of prosperity, refinement, and contentment about them.

Present Conditions.—Although general farming continues on many farms and the system of Colonial days is little changed, corn, hay, oats, barley, beans, and potatoes being raised, there has been a decided improvement in most communities. Dairying has become an active

industry on the larger farms, milk and cream being shipped to Boston and other industrial centers. Potatoes and garden truck come from the lighter soils; and in late decades the bogs, which for more than three hundred years were considered worthless, have been improved to grow cranberries. Some years more than two-thirds of the cranberries produced in the United States come from Massachusetts.

Bog reclamation is generally done by companies who lease the land or buy it outright. The cost of improving a bog is high. Unimproved bog or muck land sells for \$25–\$100 per acre, bearing cranberry land for \$100 or more. If the muck land is forested, the trees are cut and the roots dug out. If the muck is thick, some of it must be removed. Ditches two or more feet deep are excavated, to drain the lands in wet weather or to irrigate them in dry seasons. Only such bog lands as may be drained and irrigated are improved. Water is wanted especially in the fall, to protect the berries from frost, for the harvest runs into late September and even later, and for this reason bog lands along streams are in greater demand. Over the surface of the muck, a 3-inch layer of sand is spread. This makes the land firm, and in this the plants are set about three feet apart. It takes three years for the plants to reach bearing age. A thin layer of sand is applied each year; this reduces the cost of weeding and makes the gathering of the berries easier. The berries are generally gathered by hand. At nearby packing houses the berries, with bits of the vines, are cleaned and sorted and packed in barrels. The usual crop is 50–60 barrels per acre. Many of the laborers in the bogs are Cape Verde Islanders and European immigrants, for the most part a floating type of worker.

The Camden Trucking Area

The Camden Area.—There are few areas in the United States where crop adaptation and adjustment of systems of tillage to soil conditions have reached the perfection found in the Camden area of New Jersey. This is chiefly the result of the age of the region, the Swedes having planted the first colony here in 1637, the nearness to large markets and the excellent transportation facilities, and the high land values of the improved farms. As in all agricultural sections of the United States near large cities, the transportation facilities are excellent at present. Camden is the center of numerous steam and electric lines; ferry lines connect the city with Philadelphia; and small boats ply upon the lower courses of the river and give many farmers ready access to the wharves of Camden, Philadelphia, and nearby towns.

The area lies on the western margin of the Coastal Plain and borders

the Delaware River. Bordering the Delaware are terrace-like tidal flats which extend back into the westward-flowing streams some 5 or 6 miles. Some of the tidal marshland has been reclaimed by diking. Most of it can be reclaimed, but concerted action is necessary. Inland from this tidal area are remnants of two higher level terraces that border the western edge of the marine-deposited Coastal Plain. The highest part of the Coastal Plain in the Camden area, 130–200 feet A. T., lies about 12–15 miles east of the Delaware River, and from this broad crest 8–12 miles wide, the land slopes westward with a gradient of 3–5 feet per mile, but eastward much more gently. Beneath the general level the streams have cut valleys 100 or more feet deep, reaching tidewater level some 7 or 8 miles from their mouth. The streams have been at work long enough to develop broad, swampy flats in their lower courses, through which they flow in ill-defined channels.

The soils have been developed from marine beds of sand, sandy clay, gravel, greensands, and marl or glauconite.

On the deep, well-drained, warm, sandy soils are truck gardens, of 20–40 acres. Tillage with light teams and equipment is possible. Here are grown such early vegetables as tomatoes, asparagus, peas, beans, sweet potatoes, and sweet corn. Asparagus, sweet potatoes, and early Irish potatoes are generally grown on ridges thrown up by the plow. Berries are also a large crop. The heavier sandy loam grows medium to late vegetables, as Irish potatoes, tomatoes for canning, cabbage, peppers, beans, peas, corn, general farm crops, and orchard fruits, as apples, peaches, and pears. On the heavier soils are general farm crops and dairying. Here the farms are, as a rule, 100–160 acres.

Types of Farming.—At present there are several types of farming: trucking alone; a combination of general farming and trucking; and fruit raising or dairying. Dairying is important in many sections, especially on those farms where the land is suited to the growing of hay or where there is natural pasturage. The six months' growing season and the tempering influence of the waters of Delaware Bay and the Atlantic (when the wind is from the east) favors, as does the soil, the growing of fruits and vegetables. The rainfall is about 46 inches and is well distributed during the growing season. Droughts are uncommon. The driest year on record had 36 inches of rainfall.

Diversified Farming in Lancaster County, Pa.

Lancaster County, in southern Pennsylvania and bordering on the Susquehanna, is partly a Piedmont, with soil derived from schists and gneiss, and partly a limestone county. Its fame as the leading agricul-

tural county of Pennsylvania rests mainly on the limestone soils which cover more than a third of the area.

Environmental Factors.—About half of the area of the county is lowland, limestone plains, and bottom lands; the remainder is upland plateau, and hills of meta-igneous rock, the typical Piedmont rock, which stands from 200 to 600 feet above the limestone lowlands. The limestone lowlands extend east and west across the county. In the upland sections the streams have cut deep valleys, making some of it too rough for cultivation. The gradient of the streams is for the most part low, for they have been long at work and a rainfall of 40 inches or more, well distributed throughout the year, makes them perennial, particularly those fed by underground water in the limestone area. The valleys in some parts are deep, and thus some of the land is too rough for cultivation. Grist mills were established in the early days at a few points along the streams, particularly on the borders of the lowlands.

The area has always had, since its settlement, the advantage of the best in the way of transportation. The first long turnpike of Pennsylvania, the Philadelphia–Pittsburgh Road, passed through the city of Lancaster. The low relief, deep soil, and easily excavated rock of the limestone plain were the chief factors that led the engineers to lay out the Eastern Section of the Pennsylvania Canal through Lancaster, and this canal was soon paralleled by a railroad. With Philadelphia but 60 miles distant, and Baltimore about the same, excellent railroad connections to the East, and numerous small manufacturing cities within the county itself, all connected by excellent roads, the farmers have always had accessible markets. But they have been, since about 1850, on a fairly direct railroad line, the Pennsylvania, to Pittsburgh and the North Central States, and have had the competition of the farmers of the Middle West to meet. These are the leading physical and economic factors that have influenced the development of agriculture in Lancaster County.

Agricultural Adjustments.—The first settlers, Swiss Mennonites who secured land from William Penn, came in 1710. They were followed by Germans, French, English Quakers, and Scotch–Irish. The Swiss and Germans selected farms on the limestone lowlands; the Scotch–Irish, by necessity and in some cases perhaps by choice or lack of foresight, settled on the crystalline uplands in the southern part of the country.

During the entire history of the Lancaster section, general farming has been the rule. In the early decades it was extensive, becoming more and more intensive as larger markets developed, better transportation

facilities were provided, and land values advanced. The majority of the farmers during most of the agricultural history of the country have been careful, painstaking husbandmen. Live stock has always had a fairly important place on the farms. Barnyard compost and careful rotation of crops have always been leading factors in the maintenance of soil fertility. The natural fertility of the limestone soils has favored the farmer; long leaching, however, makes the liming of the soils necessary. Corn, wheat, and tobacco are the chief crops used in the three-, four-, or even six-year rotation schemes. Fertilizers are freely used. The money crops are varied: potatoes, wheat, tobacco, fruit, vegetables, dairy products, and beef cattle.

Wheat and corn were the chief field crops in the early decades. Spelt was the form of wheat raised for fully a century, then came several varieties of wheat. Tobacco has long been raised and is the chief money crop on most farms, and varieties peculiar to Lancaster County conditions have been developed. There is a prevalent local belief that the soil and climate of the section is the chief factor in giving the quality and flavor to the tobacco, and that any variety will, if planted in the section, in a few years take on the character of the Pennsylvania tobacco. The limestone soils produce as high as 2500 pounds of tobacco per acre, while many fields in crystalline rock produce only about 900 per acre. The tobacco is used chiefly for cigar filler and binder. As in other parts of America, only a small part of each farm is devoted to tobacco raising, the patches varying from 2 to 20 acres.

There are few commercial apple, pear, or peach orchards. Dairying is important on some farms, but on others not enough cows are kept to supply the families with milk, cream, and butter. Winter fattening of cattle has long received much attention, the lean cattle being purchased at the stockyards in Lancaster. From 100 to 400 carloads are received daily during part of the fall. The roughage and most of the grains used are grown on the farms of Lancaster County.

Diversified Agriculture on the Allegheny Plateau

Clearfield County in central Pennsylvania may be taken as a type agricultural area of the Allegheny Plateau where the urban population is small but where numerous railroads give access to many markets.

Physical and Economic Setting.—Although located to the west of the Allegheny Front, most of the land lies at the headwaters of the West Branch of the Susquehanna and, therefore, is deeply dissected. The valley flats in the northeast corner of the area lie only 850 feet above sea level, while the watersheds between the tributaries have

elevations of 1700–2500 feet or more. The land is, therefore, steeply rolling to hilly.

Flat to gently rolling land is found on the narrow floodlands and the broader interstream areas. In the north where sandstones and conglomerates outcrop, the surface is wild and picturesque. Here the land is poor; the slopes are steep and consequently stony, or have thin soils. This portion is little used for farming, being held by lumber companies and hunting clubs. About 60–75 per cent of the county, however, is underlain by shales and sandstones that bear workable coal seams, hence coal mining serves to give employment to some urban dwellers. The largest city has a population of about 14,000; the second in size, about 8500; and four or five range from 1000 to 3000. These cities furnish a limited local market for certain products of the farms, but coal mining and the revenue that comes to some of the farmers from coal leases detract seriously from agriculture.

The sawmill towns of the early nineteenth century furnished a small market for some products but apparently affected the general run of farmers but little. Following the coming of the Pennsylvania Railroad in 1869, there was a decline in agricultural activities in the southern part of the county, due to an increased attention to lumbering and mining; and the latter of these two activities is still a factor interfering with a better and more active utilization of the agricultural resources.

Present Conditions.—Agriculture to-day is diversified, the average annual rainfall of 44 inches and the growing season of 120–150 days permitting almost any crop of the cool temperate zone. Besides the field crops common to northern United States, nearly every farm grows vegetables for home supply and for the local market, and has a small orchard with apple, plum, and cherry trees, a berry patch, dairy cows and beef cattle, and pigs. There are no large truck gardens, only a few young commercial apple orchards, and, except near the towns, no large dairies. There are only a few flocks of sheep in the county. Some poultry is found on every farm. It is evident, then, that the farmers still have much to accomplish before they can derive the maximum advantage from their agricultural opportunities. Diversified farming calls for a complete equipment. The farms are large, outhouses numerous, often including a silo, and the farm machinery varied, consisting of wagons, plows, cultivators, harrows, rollers, seeders, binders, and mowers. The houses are well built and well kept. There is an air of prosperity, comfort, and satisfaction about most of the farms. More than 88 per cent of the farms are operated by the owners.

The Fruit Region of Northwestern New York

Early Importance.—The beginning of fruit growing in northwestern New York is unknown, for when American settlers entered the section just after the Revolutionary War they found that the Indians had for many years collected apples of European varieties. It is thought that seed had been planted by the French missionaries who visited the Indians about the middle of the seventeenth century. The American settlers brought apple seeds and stock, and there were bearing orchards west of the Genesee River by 1800. The Erie Canal and the railroads to Buffalo, New York City, and Boston opened up larger markets for the apple growers of northwestern New York. Commercial apple growing dates from 1860, and grape culture from about 1865–70. Since these dates vast orchards of apple, peach, pears, and cherries, besides large vineyards of grapes and many hundreds of acres of small fruit, have been set out, and the region has become the most important temperate-zone fruit region east of the Rockies. New York for many decades led all states in the production of apples but now holds second place. In few other places in the United States have the trees retained their vigor as in New York. There is certain to be a decline in the apple crop, however, unless more planting is done.

In western New York at present only about 20 per cent of the income of the farm is from fruit, and only a small part of each farm is given over to fruit growing. The Indians raised such quantities of corn, beans, and pumpkins that the section was considered a great storehouse of foods, and General Sullivan, in 1779, was sent by the Americans to the region to destroy crops and stores of food to prevent their being sold to the British army.

Wheat and corn were the first crops raised by the American settlers, and the Genesee section for a few decades was celebrated as a wheat region. For three or four decades wheat was grown mainly for local consumption, for contact with the larger markets was had only by ox-wagons. The cost of transportation to New York City by this means was three times the price of the wheat. Flour mills were erected in 1820 at the falls of the Genesee River at Rochester, and flour was shipped to Canada by way of Lake Ontario, and to Buffalo and the East after the opening of the Erie Canal. With the settlement of the cheap prairie lands of Illinois, and later of Minnesota and Dakota, the area of commercial wheat growing was greatly expanded, and although the Genesee region continued to produce about as many bushels as formerly, relatively its output was, and is, so small that people no longer think of it as a wheat-growing section. The yield per acre is greater now than in the

wheat regions of the Middle West and greater than it was seventy-five years ago, a testimony of the careful tillage practiced.

Physical Factors.—Monroe County, which we are taking as a type area of northwestern New York, has a variety of soils. Most of them are lacustrine in origin; even the glacial deposits, in most instances, were deposited in glacial lake waters. Crop adaptation to soil is a problem that the careful farmer has attempted to work out. Glaciated land, because of the great variety of soils generally found on even a small farm, offers exceptional opportunities for experimentation. The large industrial population of Rochester gives an admirable market for the products of intensive cultivation. Another factor influencing agriculture, particularly fruit growing, is the retarding influence of lake winds on the spring temperatures, tending to delay budding until danger from late frosts has passed. The farmers of northwestern New York, therefore, are operating under many favorable conditions. The air of comfort, refinement, and prosperity that is seen on every hand is an evidence that they have responded to the advantages of their environment. Nearly all the land of Monroe County outside of Rochester is in farms, and about 90 per cent of the farm land is improved.

The fine sandy and sandy loam and muck soils are used for garden truck, early potatoes, nursery stock, small fruit, peaches and cherries. Grapes are also grown on this soil near Lake Ontario. For apples and pear orchards, loam soils are generally selected; and the clay loams and heavy clays are used for growing grains and grass.

Diversified farming is the rule; but fruit growing, truck gardening, potato growing, and dairying are special forms to be found, rarely more than one on any one farm, throughout the county.

QUESTIONS, EXERCISES, AND PROBLEMS

1. Make a statistical comparison of the agriculture of two counties in Pennsylvania, one well over on the Allegheny Plateau (Indiana or Somerset County) and another on the Piedmont (Chester County). Vol. VI, Part 1, Census Report, 1920, will supply data. The selection of the items for comparison is left to teacher and students.

2. What tendencies toward intensification of agriculture are in evidence in the Northeastern States? What are some of the probable causes of this tendency?

3. Make a graphic comparison of the changes from 1850 to 1920 in number of farms, acres of land in farms, and improved land in farms in New England, the Middle Atlantic, East North Central, West South Central, and Pacific States. Vol. V, Census Report, 1920, page 38, will supply data. Write a discussion of the graphs.

4. Compare changes in percentage of total land area in farms and of improved land in farms in United States, in New England, the Middle Atlantic, West North Central, South Atlantic, and Mountain States. Write your conclusions.

5. What portions of our country and other parts of the world contribute to the food supply of New York? How has improved transportation affected the area of New York's sustenance space? Trace out the development of improvements affecting transportation.

6. What natural conditions, climatic and topographic, have been taken advantage of in fruit raising in the Northeastern States?

7. Does California or New York possess the better natural conditions for drying fruit? Which one will be likely to win out in the struggle if natural conditions dominate?

CHAPTER VI

MANUFACTURING IN THE NORTHEASTERN STATES

FACTORS OF LOCALIZATION

ALTHOUGH the Northeastern group of states has only 5.6 per cent of the area of the United States and only 28.1 per cent of the population, it had in 1919 46 per cent of the wage earners (9,000,000 for U. S.), engaged in manufacturing, and 70 per cent of the capital invested, and turned out 43.5 per cent (in value) of the manufactured products ($62,000,000,000). The value added by manufacture was 46.6 per cent of the total value added in the country. (Fig. 78.) Practically every type of industry is represented in these states. Indeed, the variety of product, from the lady's watch to the giant locomotive, from the coarsest cotton to the finest silk, from the deadliest and most powerful chemicals to perfumes, is one of the outstanding characteristics of the industrial development.

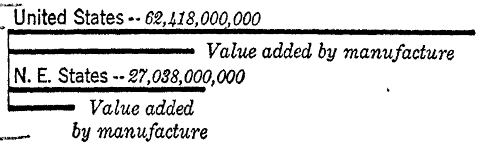


FIG. 78.—Value of Manufactured Products in United States and the Northeastern States, 1919

About 43 per cent of the fabricated products of United States came from the factories of the Northeast, in 1919.

What are the natural advantages that make this group of states the greatest manufacturing section of the country?

The Power Resources of the Northeastern States.—The abundance of power resources and fuel is one of the outstanding advantages. Water power has all along been one of the factors that tended to localize factories. In Colonial days, nearly every rapids and falls in southern New England, along the Hudson and Mohawk Valleys, in northern New Jersey, and in southeastern Pennsylvania, had beside it a factory of some sort—sawmill, gristmill, carding mill, fulling mill, or blast furnace—or perhaps several factories, the power generally being supplied by an overshot water wheel. The numerous power sites in the glaciated portion of these states gave an opportunity for wide dispersal of factories in the early days when they were all small and required only a small stream of water for power. The power sites to be used first were along the coast, where the waters of the plateau fall over the edge of the plateau, the Fall

Line. About these power sites, in time, great industrial cities grew up, as Fall River, Providence, New Bedford, and others. The power sites in the interior are largely at boulder dams in the post-glacial channels of the streams, at the edge of filled pre-glacial valleys where the course of the post-glacial stream departs from that of the pre-glacial, and where streams flow from more resistant to less resistant rocks. The forest cover, the numerous glacial lakes and marshes, and a rainfall of 30–50 or more inches fairly evenly distributed throughout the year, all tend to give the rivers flowing from or in the glaciated area a fairly constant flow.

Water Power of New England.—New England industries and public utilities are now utilizing nearly to the limit the power of the rapids and falls which they have harnessed; indeed, the power actually developed and used in New Hampshire, Vermont, Massachusetts, Rhode Island, and Connecticut (table, p. 123) is in excess of the estimated available low-water horse power, as determined by the usual method employed by the United States Geological Survey. Many a factory uses steam power to supplement water power and tide it over the low-water season.

The wide distribution of power sites tended to give the Colonial factories a wide distribution, and thus to make for "democracy" in the industrial world; but as large machines came to be built, as well as large factories equipped with a great variety of large machines, many a small mill beside a small rapids or falls lost out, and industries came to be concentrated at the larger power sites. Fortunately for some small power sites, the railroad came with coal, and a steam plant was used to supply the power needed for factory expansion; but this was not until about the middle of the last century. Even large plants at medium-sized power sites were checked in their expansion. The expansion of the textile mills at Waltham, Massachusets, is a typical example. The first complete cotton factory of the state was built at Waltham in 1814, utilizing the power of the small Charles River. By 1820 the power capacity of the falls had been reached, and the company purchased a site on the Merrimac where the water has a fall of 32 feet. Here Lowell grew up, and came to have, in a short time, thirty-three mills. Before the invention of the dynamo-motor the factory utilizing water power had to be located at the falls, rapids, or dam, and thus the number of factories that could be secured by a power site was limited.

At present, the rivers of Maine furnish 525,500 H.P.[1] and this may be increased by storage dams. Most of the fall occurs in the rivers where they flow down the eastern slope of the Eastern Mountain

[1] Data supplied by U. S. G. S., Jan. 1, 1927. All data for individual rivers are from Atlas of Com. Geology, 1920.

and Plateau Area to the New England Upland. The numerous large lakes of the region are admirable natural storage basins. Three plants on the west branch of the Penobscot develop 30,000 H.P. for use in the pulp and paper mills. The plants on the Androscoggin in Maine develop 121,000 H.P., and the upper stretches of the river in New Hampshire give 47,000 H.P., available 60 per cent of the time.

The Merrimac furnishes 22,000 H.P. at Manchester, N. H., 24,000 at Lowell, and 26,000 at Lawrence. On the Connecticut at Holyoke, Mass., several small plants have been built that develop 48,000 H.P., the first dam having been built early in the last century to furnish power for cotton mills. About 66,000 H.P. are developed on the Connecticut at Turner's Falls, Mass., near Greenfield; and 30,000 are provided for at Vernon, Vt. On the flanks of the Green Mountain region, from northern Vermont far into Connecticut, are numerous power sites.

The Deerfield River on the east slope in Massachusetts, alone, has plants installed that develop 58,000 H.P. Between 1800 and 1850, twenty-seven paper mills were built on the borders of the Berkshire Valley on the west slope, all using water power. At the town of Lee alone, there were eighteen mills; but when the heavy Foudrinier paper machines, which turn out sheets of paper miles long and which demand a great amount of power, came to be used, many of the small paper mills had to be abandoned. Abandoned power sites, with their picturesque overshot water wheels, and moss-covered factories beside a half-filled mill pond, were and still are in some parts of New England only a little less common than abandoned farms. Both represent adjustments to changing economic conditions.

Water Power of New York.—On the Hudson, Black, and Oswego Rivers in New York, are many large power plants. The numerous streams descending from the mountain and plateau borders of the Hudson and the Mohawk early furnished power for the gristmills, sawmills, and oil mills. Most of the larger sites have come to be utilized only in recent decades. About the falls of the Genesee where the water power was used early in the last century to grind the wheat grown in the nearby region, Rochester grew up. The great industrial development here has far outrun the power resources of the falls, and coal is brought from the coal fields of Pennsylvania. The largest power plants in New York state to-day (except those at Niagara Falls) are at Spier Falls and Glens Falls on the Hudson, where 38,000 H.P. and 40,000 H.P., respectively, are developed. At Cohoes, where the Mohawk falls 103 feet in a series of rapids as it enters the Hudson Valley, and at Little Falls, where there is a fall of 245 feet in a half mile, are important power plants. The Mohawk system alone has a poten-

tial water power of approximately 180,000 H.P., with less than 60,000 H.P. developed. The most important power sites in North America are about Niagara Falls, although the "lion's share" of the power goes ~~to Canada.~~ On the American side of the falls the plants have 385,000[2] H.P. capacity. The output is used locally in many plants, particularly in the electric chemical industries, and is distributed widely over western New York.

Power in Pennsylvania and New Jersey.—The small power sites in both Pennsylvania and New Jersey were early used, as in New England and New York. The largest single development to-day in Pennsylvania is at McCalls Ferry on the lower Susquehanna. Here immense turbines capable of developing 118,000 H.P. have been built, and electricity is furnished to Philadelphia, Baltimore, Washington, and many smaller cities. There are many other sites utilized on the Susquehanna, but, since most of Pennsylvania lies outside the glaciated area and has mature topography, the flow of the streams is not so regular as in New England. The Allegheny, Monongahela, and Youghiogheny all have much potential power. Hydroelectric plants are replacing the old water wheels. There are several plants now in operation along the Monongahela, and the resources of the Allegheny are about to be utilized.

New England and New York, both coalless, have made the most of their water-power resources; but Pennsylvania, rich in coal and still producing oil and gas, has had good reasons for its belated utilization of its water-power resources.

Super-power Systems.—In order to make the greatest possible use of the power potentialities of the many electric plants in the Northeastern States or in a part of these states, both steam and water, great "super-power" systems are being developed in which all the larger power plants and stations are to be connected so that electricity may be transferred from one plant or station to one or more of the others. These are not to be great monopolies but coördination systems, each plant maintaining its identity but being able, if necessary, to secure electricity from other generating plants or dispose of its excess, and thus meet the varying local demands. A great saving will result in the greater possibility of keeping the plants running at their full capacity all the time, and thus fewer plants will be needed. It is planned to have a closer coördination of electric and steam plant. The steam plants are to be run when excess demands call for their assistance. Early in 1924, eleven electric-power manufacturing companies, operating in Ohio,

[2] The figures for January, 1, 1927, were 515,418 H.P. on the American side; 993,700 H.P. on the Canadian.

Pennsylvania, Virginia, West Virginia, and Maryland, agreed to organize their power plants into a super-power system to be known as the Coal Field Super-power Group. This system can readily be connected with the power group being developed in other parts of the Northeastern States and even with the ones in use in the south.

Summary of Power Resources.—The water-power resources of the Northeastern States are as follows:

TABLE VI

TOTAL POTENTIAL WATER POWER OF NORTHEASTERN STATES *

	Potential Available 90 Per Cent of the Time	Potential Available 50 Per Cent of the Time	Developed Jan. 1, 1927
Maine	536,000	1,074,000	525,509
New Hampshire	186,000	350,000	277,252
Vermont	80,000	169,000	200,157
Massachusetts	106,000	235,000	353,939
Rhode Island	25,000	40,000	30,188
Connecticut	65,000	110,000	148,423
New York	4,010,000	4,960,000	1,757,355
New Jersey	50,000	90,000	18,902
Pennsylvania	257,000	638,000	279,596
Total	5,315,000	7,666,000	3,591,321
Total for U. S.	34,818,000	55,030,000	11,720,983

* Data prepared by the U. S. G. S. and Federal Power Commission; issued 1925 and 1927.

The primary horsepower employed in the industries in the Northeastern States is more than 12,000,000. Since only about 3,600,000 H.P. are furnished by the water-power plants of this section for factory use, public utilities, and electric and electrified railways, it is evident (the above figures are only loosely comparable) that coal, oil, and gas furnish most of the power for the many thousands of industrial plants; and most of the coal, oil, and gas is furnished by Pennsylvania. (Fig. 40.)

The Coal Resources.—In eastern Pennsylvania is the only important anthracite coal field now being worked in the world. From beneath an area of about 478 square miles, about 92,700,000 tons of anthracite are mined annually, mainly from the mines along the Wyoming Valley from Wilkes-Barre through Scranton on to Carbondale and in a detached

area of irregular shape from Hazleton southwestward to Shamokin and Pottsville. The original supply is estimated to have been 21,000,000,000 tons. Anthracite was first discovered in the Wyoming Valley in 1762, but it was fully half a century later before it was mined on a commercial scale. In 1820 only 365 tons were taken out; about 1840 it began to be mined on a large scale for fuel in blast furnaces. Most of the anthracite mined to-day is for domestic use, although many steam boilers in factories are heated with it in Philadelphia, New York, and other nearby cities. A large percentage of the homes, even as far west as the Great Lakes Region, are heated by anthracite.

In western Pennsylvania there are about 14,000 square miles of coal lands, the annual output being more than 169,000,000 tons (in 1923), and the estimated available supply yet in the ground more than 100,000,000,000 tons. Pennsylvania produces each year about one-third of the bituminous output of the country, and it is Pennsylvanian coal that runs the larger portion of the factories of the Northeastern States, although coal from Ohio, West Virginia, and Maryland gets to some of them. The railroad is the chief distributing agent, carrying coal directly to the factories or to the seaboard for shipment by water. The Chesapeake Bay and Delaware Bay coal docks load coal for New England. About 15,000,000 tons are shipped each year to New York, 7,000,000–8,000,000 tons to Ohio, 7,000,000 to New England, 4,000,000 to New Jersey, and lesser amounts to more than twenty-five other states. Coal from the Northern Appalachian fields is transported as far west as the Pacific Coast and southward to the Gulf Coast. About 40 per cent of the total output of Pennsylvania is used within the state in coke making and on the railroads and in the mines and factories. The abundance of coal enables western Pennsylvania to turn out many products, such as heavy machines, glass, special steels, and others, that could not be manufactured in sections where coal is scarce.

About half of the bituminous coal of Pennsylvania comes from the Pittsburgh seam, a bed which is about 6 feet thick, having an areal extent of some 2500 square miles, and furnishing one of the best coals produced in America. It is hard, for bituminous, does not break up readily, and hence stands long-distance shipping and frequent transshipping. It gives 36–38 per cent of volatile matter in gas plants, makes excellent coke, and gives good results in furnaces in houses and factories. Much of the bituminous coal of Pennsylvania is obtained by drift mining, the outcrop occurring in the borders of the deep valleys that dissect the Allegheny plateau. The beds are very regular in thickness and quality of coal, are generally free from shale, and are practically horizontal. The larger part of the coal is mined by machinery. The

mining of bituminous coal is therefore much easier than that of anthracite which occurs in steeply inclined beds that have been folded and faulted. Some deposits of anthracite are reached only by deep shafts, and machines are little used. This is the chief reason for the high price of anthracite coal in comparison with bituminous.

Many explorers had made mention of the coal deposits of western Pennsylvania before the Revolutionary War. The British garrison at Fort Pitt, shortly after the French vacated Fort Duquesne, used coal for fuel. The pioneer farmers used it,many shiploads being floated down the Monongahela, and even the Ohio, before 1800. Commercial mining began shortly after 1820. Only 3080 tons of coal were mined in the United

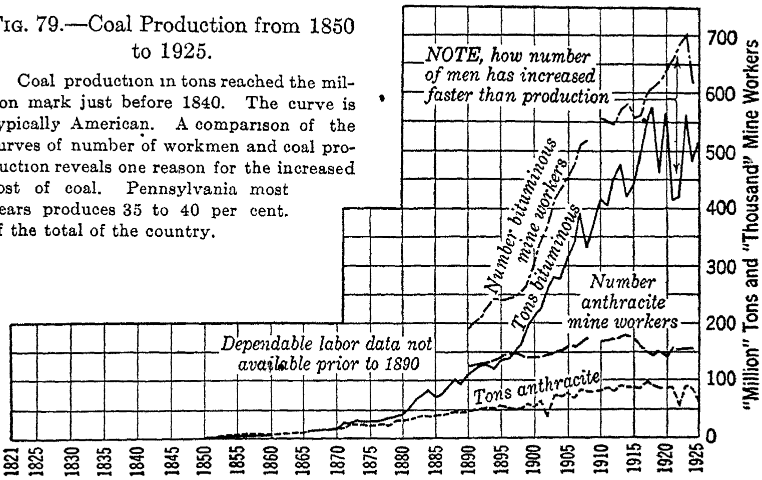


FIG. 79.—Coal Production from 1850 to 1925.

Coal production in tons reached the million mark just before 1840. The curve is typically American. A comparison of the curves of number of workmen and coal production reveals one reason for the increased cost of coal. Pennsylvania most years produces 35 to 40 per cent. of the total of the country.

Courtesy of Samuel S. Wyer, Engineer, Columbus, Ohio.

States in 1820; 286,000 in 1830; and only 1,850,000 in 1840. The output of the United States to-day is nearly one hundred times that of 1850. For many decades Pennsylvania produced nearly all the commercial coal of the country. (Fig. 79.)

Petroleum as a Raw Product, Fuel, and Power Resource.—Western Pennsylvania and southwestern New York were for a few decades, up to about 1895, the greatest petroleum-producing section of the country. In fact, the petroleum industry of the world had its birth in this region and it was here that the methods of drilling, pumping, transporting, and refining of petroleum, now in use the world over, were developed. The French explorer Charlevoix made mention of oil on the upper Allegheny. The Indians and early pioneers collected oil for medicinal purposes from the surface of the small streams. The first shipment, nine barrels, to

New York, was bottled and used for medicine, the price received being $275. Various attempts were made to collect the oil on a commercial scale from the surface of creeks and ponds, but without success. It was Colonel Drake of New York who made the first attempt to secure a larger supply by sinking a shaft, and then a pipe, to the "pool" from which the surface oil evidently came. This was a new venture, for nothing was known of the stratigraphy of oil deposits and little of well drilling. Fortunately the oil pool was reached at a depth of only 69.5 feet and oil came within 10 feet of the surface of the ground in the pipes. In the first four months, 2000 barrels were pumped from the well. This success of Colonel Drake incited others to drilling, and in a few months there were scores of wells. The drillers gained in experience and deeper holes were attempted. A gusher was struck at a depth of 400 feet in 1861. In 1860 the production was nearly 700,000 barrels, and by 1861 more than 2,000,000 barrels. The supply soon came to exceed the demand and prices fell. Before there could be much demand, uses had to be found for the oil, lamps invented to burn it, and refineries provided to prepare it for use. Until the development of the internal combustion engine and the era of the automobile, kerosene was the chief product the refiners were making.

Eventually other fields were opened up, about 1885 in Ohio, 1890 in West Virginia; and by 1895 California was producing about a million barrels a year. In the meantime the oil wells of Pennsylvania and New York declined. In 1920 Pennsylvania was producing only 7.1 per cent of the petroleum of the country. The many refineries established to handle the product of the Pennsylvania oil wells are now refining oil from every field east of the Rockies. Oil is the basis of a large refining industry producing kerosene, gasoline, and many by-products; but oil has also been, like natural gas, much used as fuel in the factories and has therefore been a factor in the localization of industries. (Fig. 41.)

The Abundance of Natural Gas.—Natural gas, called "the most perfect fuel nature furnishes us," was found in most oil pools and escaped from many wells. The first gas well was sunk in 1879. Since about 1890 gas has been widely used as fuel in iron and steel mills, and in the manufacture of glass, porcelain, and cement. It is a common domestic fuel in both country and city in western Pennsylvania. Pipe lines bring it in from West Virginia and distribute it to cities outside the natural gas section. It is rapidly declining in quantity, however. Even with all waste eliminated and its use confined to domestic purposes, the deposits will not last twenty years. Natural gas has served to localize many factories. Being a cheap fuel and easily handled, it enabled gas-using factories to produce their products at low cost.

Manufactured gas (coal gas) is sold for five or six times the price of natural gas.

Abundance of cheap coal, petroleum, and natural gas have for about half a century or more been important factors in encouraging industries in the Northeastern States, some parts, of course, being more favored than others. New England has been the least benefited, western Pennsylvania the most. Coal is used in all parts of this group of states, but oil and gas mainly where they are produced. New England has its water power to compensate for its lack of mineral fuel deposits and has specialized in products that require little fuel in their manufacture.

Sources of Raw Products.—Many of the raw products needed in manufactures occur in limited quantities and in great variety in the Northeastern States. The coniferous and hardwood forests (Fig. 43) have long supplied raw material for saw and planing mills, pulp and paper mills, furniture factories, shipbuilding plants, and box and cooperage factories, as well as bark for the large tanning industry. (Figs. 80 and 81.) Herring, cod, mackerel, oyster, and other fisheries off the coast furnish raw products for the canning, drying, smoking, and pickling industry, as well as for the fish-oil and fertilizer factories. The canning industry uses vegetables from New Jersey and Long Island, berries from widely scattered areas, and peaches from northwestern New York, southern New England, and other sections. Grape juice from the grapes of the Finger Lakes and Lake Ontario vineyards is well known over most of eastern United States. Butter, cheese, and condensed milk are some of the products of the dairies. The wheat fields, although far surpassed by those of the Middle West, still furnish some raw material for the flour mills.

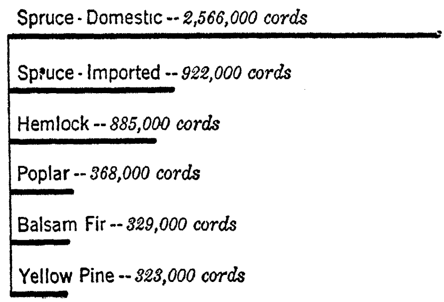
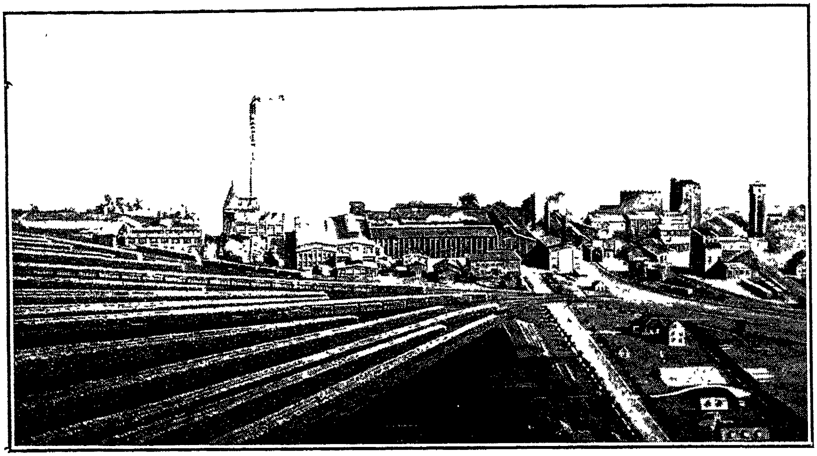


FIG. 80.—Kinds of Pulpwood Consumption in United States, 1923.

Spruce is the wood most used in the pulp and paper factories of the Northeastern States and yellow pine in the South.

For more than two hundred years the iron industry of these states used local ore deposits entirely, and some of the deposits in New York and New Jersey still supply small amounts. From the widespread clay deposits the numerous brick yards secure their material, and the pottery works at Trenton once depended entirely upon local supplies of clay. The shale and limestone of the Lehigh Valley are the basic materials



Courtesy Hammermill Paper Company

FIG. 81.—A Paper Mill at Erie, Pennsylvania.

Pulp wood may be obtained from the forests of both United States and Canada. Canadian wood may reach the plant by lake vessels. Coal is near at hand and Lake Erie supplies the immense quantities of clear water needed. This one plant pumps and filters enough water to supply the needs of a city of 100,000 people.

used in cement making. It was in this valley that the first Portland cement of the United States was made about 1890; and to-day, even though cement making has become widely distributed, the Lehigh Valley is still the leading cement section of the country. (Fig. 81.) The close proximity of many large cities in need of cheap and serviceable fireproof building material to the Lehigh cement section is another factor in the prominence that the cement industry holds in these states. The Hudson Valley also has cement plants utilizing local deposits of clay and limestone.

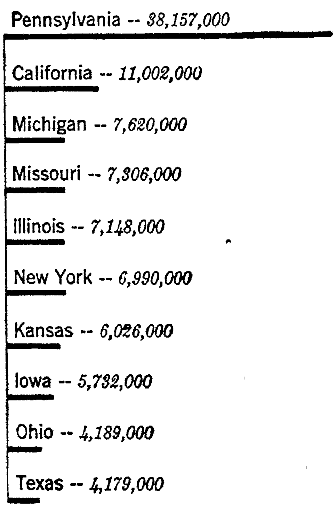


FIG. 81*a*.—Production of Portland Cement (Barrels), 1923.

Pennsylvania has held the leadership since the beginning of the industry in United States. The graph indicates the wide distribution of the industry, a response to high freight rates and low per hundredweight value.

The Indians obtained brine from the salt springs of central New York, and ever since the arrival of the white man salt making has been an important industry of Onondaga County. It was an important factor in the early growth of Syracuse. Salt deposits have been struck by boring at many points

in central and western New York. Brine pumped from Tully to Solvay near Syracuse is used, with limestone, in the manufacture of immense quantities of soda and allied products.

There are many other minerals of considerable commercial value which are directly or indirectly associated with manufacturing. In New England there are at present few minerals produced other than granite, slate, marble, limestone, basalt, and sandstone. Some of the granite and marble quarried is worked up into finished forms, cut, smoothed, and polished, at the quarries, but stone cutting and polishing is an industry in many towns and cities. Talc occurs in northern New York and Vermont. Graphite, used in the making of lead pencils and crucibles, is found near Lake George, New York. The gypsum of central New York is manufactured into plaster of Paris and other wall finishes. Mineral pigments—red, brown, and yellow ochre, green shales, and slates, and red iron ore—are ground for paints. Feldspar is utilized in the pottery industry. Indeed, in no other section of the United States is so great a use made of the products of the mine and quarry.

The great industries of these states to-day, however, the textile, iron, steel, and other metals, and leather, rubber, paper and pulp, depend largely or wholly upon products brought into the section from other parts of the United States or from foreign countries. Most of the iron ore that makes Pennsylvania the greatest pig iron and steel producing state of the Union comes from the Lake Superior region, with smaller quantities from Cuba and Spain. (Fig. 133.) Zinc and lead do occur in New Jersey but only in small quantities. The hundreds of plants turning out automobiles, steam and gas engines, locomotives, dynamos and motors, railroad coaches and cars, stoves, tools, builders' hardware, machines for use in the textile, woodworking, paper, leather, and shoe industry, firearms and plumbers' supplies, and a thousand other products, are using metals that have been directly or indirectly secured from other parts of United States and even from foreign countries.

All the cotton and silk, and nearly all the wool used in the widely distributed and varied textile industries, come from outside these states. Most of the hides come from the slaughter houses of the North Central States or are imported from temperate South America, Australia, or elsewhere. More and more the pulp and paper industry is dependent on Canadian forests, and the wood-working industries on lumber brought from the South, the Pacific Coast, Canada, or the tropics. The necessity for importing so many and so much of the raw materials handicaps the industries but slightly if at all, for the factories and their reputation are already well established, power is plentiful and cheap, and numerous and direct traffic lines give this section superior advantages in collecting

raw materials and distributing the finished products. All the seaports of the Northeastern States were important commercial centers before they became industrial centers, and commerce to-day absorbs the energies of a large part of their people.

Strategic Location for Manufacturing.—The position of these states on the border of the greatest commercial ocean, the Atlantic, is of supreme advantage. As a result of the sinking of the coastline and the formation of indentations that project back into the continent, the four largest cities, Boston, New York, Philadelphia, and Baltimore, although on the edge of the Appalachian belt, are on the ocean. Fortunately, the coastal plain that guards the eastern border of the old land from Cape Cod southward is dissected by estuaries, and these cities have every access to the world-ocean traffic routes. The contact that the Northeastern States enjoy with the ocean through the many harbors, and their position between the ocean and the great "heart" of America, the Great Central Plain, make them the greatest transit region of the American continent.

Equally important are the low passes of the Northern Appalachians, the lowest of which is the Hudson-Mohawk Depression that opens out upon the lake plains of western New York. (Fig. 70.)

The commercial contact with the Great Central Plain was not obtained without effort on the part of the northern seaboard cities, for the natural tendency of the trade was to move southward with the currents of the Mississippi and its tributaries and make New Orleans the great emporium of the Central Plain. Not only did the eastern seaboard cities struggle against geography to turn the traffic eastward but they struggled with each other. Although all benefited from this struggle, the one most favored by natural traffic lines benefited most.

Struggle for Commerce of Interior.—In the first phase of the struggle for the control of the commerce of the Middle West, roads were built. In road building, Baltimore had the advantage as to distance, and, moreover, it was assisted by the National Government in building the National Pike from Cumberland, Maryland, to Wheeling, West Virginia, and beyond. Pennsylvania built the Philadelphia-Pittsburgh Pike; and New York, a road from Albany to Buffalo. All these were well traveled; along them moved as much of the products of the Middle West and the manufactures of the East as could stand high freight charges.

In the second phase of the struggle canals were dug. Boston, recognizing the great barrier the Hoosac and Taconic mountains offered, made only a feeble attempt to get to the Mohawk Lowland.

Baltimore, financed by Maryland, started the Chesapeake and

Ohio Canal and in time built it as far west as Cumberland, Maryland. Further progress was stopped by the Allegheny Front and the building of the Baltimore and Ohio Railroad, which was started in 1828. Philadelphia, assisted by Pennsylvania, pushed the Pennsylvania Canal and Portage Railroad to Pittsburgh, but not until long after New York had completed the Erie Canal along the Hudson-Mohawk Depression and across the lake plains to Buffalo. In canal building, New York led all the rest and was the first to get its artificial water line across the Highlands to the great productive interior. Moreover, at Buffalo the Erie Canal connected with the Great Lakes, which lead a thousand miles back into the Great Central Plain. Canals were built to connect the Ohio River with Lake Erie, and thus the commerce of nearly all of Illinois, Indiana, and Ohio, as well as the states to the north, flowed eastward through the Erie Canal. Thus an immense area, rapidly being settled and developed, was made tributary to New York. The beginning of the leadership of New York dates from the opening of the Erie Canal in 1825. The Erie Canal is the only one of the great state canal systems, built in the early part of the nineteenth century, that survived railroad competition. In recent years, at a cost of more than $110,000,000, the State of New York has enlarged this canal, now called the New York Barge Canal, to float boats drawing 10–11 feet of water. This gives a water route, 790 miles long, from New York to Buffalo, that has a capacity of 20,000,000 tons per year. (Fig 82.)

In railroad building, the third stage in the stampede for interior commerce, New York led also. In fact, one of the first railroads of the country was in eastern New York, near Albany. Before 1842, railroad communication between Albany and Buffalo was established, and shortly after, the Erie Railroad, the first trunk line in America, connected New York with Lake Erie in an almost direct line across the Allegheny Plateau along river valleys. In 1855 New York, because of these successes in laying out traffic lines, had drawn to itself a large part of the traffic of the Upper Mississippi Valley and the Lakes Region. The railroad, however, also gave Boston, Philadelphia, and Baltimore an opportunity to get a share of the interior trade. There are several well-known railroads that cross the Northern Appalachian Region, the Baltimore and Ohio, the Boston and Albany, the New York Central, the Erie, the Lackawanna, the Lehigh Valley, and the Pennsylvania. (Fig. 83.)

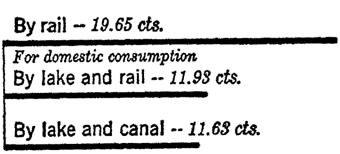


FIG. 82.—Freight Rates on Wheat from Chicago to New York, 1922.

In spite of the higher rail rate most of the grain reaches New York by rail either from Buffalo or Chicago.

For the reasons indicated above, this group of states may well be called the "bridge states." The eastern approaches to the "bridge"

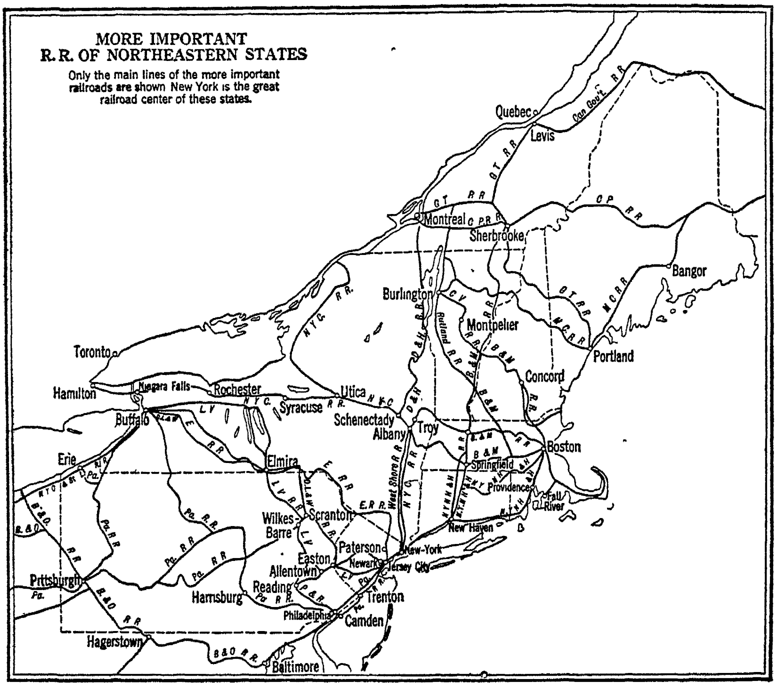


FIG. 83.

Most of the more important railroads of these states connect the larger ports with the great northern interior. The greatest rail thoroughfare lies between New York and Philadelphia.

are the New York, Massachusetts, Delaware, and Chesapeake Bays, which lead to the Atlantic and thus to the world ocean. At the western

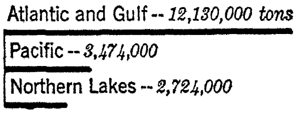


FIG. 84.—Tonnage of Vessels Owned, 1922. Gross Tonnage.

The greatest shipping is at the ports on the border of the best settled portions of the continent; moreover, the Atlantic is the most active of the oceans in commerce.

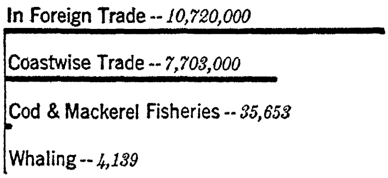


FIG. 85.—Tonnage of Vessels in Merchant Marine, Employed in Various Trades, 1922.

approach are the Great Lakes, the Ohio River, and the numerous railroads that span the continent. In fact, most of the commerce and trade

of the immense area that extends from the Middle Atlantic Seaboard nearly to the Pacific crosses the Northern Appalachian Region. The factories of this region, therefore, can draw raw materials from a vast area both in America and in the world at large, and manufactured goods have access to a wide market. (Figs. 83, 84, and 85.)

The Abundant Labor Supply.—The great number of workmen available, skilled and unskilled, because of the dense population, is another important factor in the localizing of industries in the Northeastern States.

The population density of New England as a whole is 118 to the square mile, and that of the Middle Atlantic States 223, while the population densities of the chief manufacturing states are 194.5 for Pennsylvania, 218 for New York, 286 for Connecticut, 420 for New Jersey, 479 for Massachusetts, and 566 for Rhode Island. These are high densities for a section as young in its industrial development as is the Northern Appalachian Region. Nearly all the better lands have been taken and are being tilled intensively, land values are high, rents are high, " free goods " are scarce, and the factory offers about the only opportunity to the thousands who work with their hands. The North Atlantic ports are the chief immigrant-receiving stations of the country. The total immigrants and alien passengers entering the United States from 1820 to 1915 were about 30,000,000, most of them coming to the Northern Appalachian States. Since most of the immigrants who come seeking work have not the means to begin commercial enterprises or farming, they seek employment in the factories in these cities. The whole foreign-born population of New York City in 1920 numbered nearly 2,000,000, the total population being 5,620,000 in municipal New York, Boston had 239,000 white foreign-born in the total population of 748,000. Newark had 117,000 out of a total population of 415,000. Philadelphia, being less important as an immigrant port, had 398,000 in the total 1,824,000.

There are several other factors of long standing that have contributed, and are contributing, to make this a great manufacturing region. During the Colonial period the Appalachian barrier tended to hold the people near the seaboard, thus checking the natural tendency toward expansion, and forced them into more intensive utilization of the resources. The limited area suitable for agricultural expansion in New England, the large area of hilly and mountainous land, and the thin and patchy soil limited the agricultural opportunities and forced men and women into various other economic fields. The fisheries and the merchant marine offered some outlet for the economic activities of the people, but always many were engaged in manufacturing. Manufacturing was

also stimulated by the high cost of European goods which had to be carried 3000 or more miles in small and slow ships.

From early Colonial times the manufacturers of the Northeastern States have had skilled craftsmen from whom to select their workmen. In coming to a pioneer environment where civilization by necessity was "stripped of its non-essentials," there was naturally some economic retrogression. There were complaints that many workmen had abandoned their trades for agriculture, yet many of those migrating had been reared for generations in the atmosphere of the workshop of the city and were not so easily attracted to the land as were their descendants in the following generations. But the factories rarely suffered because of scarcity of labor.

In 1650 Boston is reported as having skilled craftsmen in many trades. In Philadelphia there were shoemakers, coopers, wool combers, potters, tanners, felt makers, brick makers, blacksmiths, silversmiths, and many others.

The industries of many ports of the Northeastern States are old enough to have passed into the more advanced stages of manufacturing in which the artistic is emphasized. Quality is recognized as more desirable in manufacture than quantity. The conception of careful workmanship is a tradition carried over from one generation to the next. In an old manufacturing region there is likely to be greater wealth, more refined surroundings, better schools, and more art, than in new industrial areas. The Pittsburgh environment, with its huge blast furnaces and its great factories that demand an enormous amount of power, will probably never, in spite of its art museums and beautiful architecture, develop workmen—like those of eastern Pennsylvania, New Jersey, New York, and New England, and particularly the latter—that take pride in producing articles of beauty. It has taken nearly three centuries to develop the eastern environment in which are manufactured most of the artistic commodities displayed in our "exclusive" shops to-day.

The Financial Center of the United States.—Money with which to start factories has always been easier to obtain in those states than in other sections. The greatest money-loaning regions of the world are those in which commerce and manufacturing have long been prominent. The capital of the North Atlantic seaboard cities has financed the enterprises of the whole country. The profits of capitalists and the savings of millions of well-paid workmen have always been available for investment in legitimate manufacturing enterprises in the Northeastern States.

THE LEADING MANUFACTURING REGIONS

Although the great majority of the people of the Northeastern States are connected in one way or another with manufacturing, the industrial regions occupy only a small part of the total area of these states. Moreover, these regions are widely scattered (Fig. 86), being chiefly near the sea, along natural lines of transportation, or near sources of power.

The Boston Bay Region and Its Industries.—The Boston Bay region is the oldest manufacturing area in the United States and in some ways

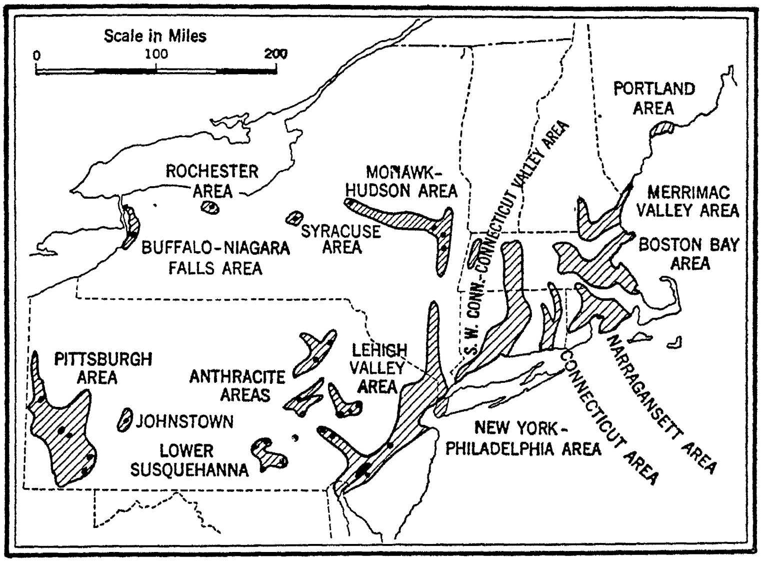


FIG. 86.—The More Important Manufacturing Areas in the Northeastern States.
Although manufacturing is the dominant activity of the Northeastern States, the manufacturing areas form but a small part of the total area of these states.

is the "mother" of other New England regions, since the success of industries in this area led to their establishment in others. Boston has also given financial assistance to many other manufacturing sections outside of New England.

The high cost of imported manufactured goods in Colonial days, due to the heavy freight rates and enormous profits sought by importers, and the necessity of adding to the meager returns from farming led the people to try their hand at providing themselves with clothing, implements, and other articles that we class as manufactured goods. Industrial development, however, encountered the difficulties usually experienced in new countries. The abundance of cheap land led some good

craftsmen to abandon trades they had spent years to learn; yet, through government encouragement, in various ways, there was a steady though slow growth in manufacturing. For a century or two these manufactures were almost wholly carried on in the home—household industries—and were small in total volume; yet ideals of good craftsmanship and skill were being developed. The relative abundance of power was also a favorable factor in the early periods; but in the last century, because of the increase in both number and size of industrial plants, large quantities of coal have been consumed, for the demands for power have exceeded the quantity supplied by water power. In many plants at waterfalls, coal is used to supplement water power during the dry seasons.

The most important industry in the Boston area to-day is the making of shoes and other leather goods. Boston, Brockton, Lynn, Salem, Weymouth, Beverly, and Worcester are the more important shoe-manufacturing towns. Boston, Brockton, and Weymouth specialize in men's shoes, and Salem, Lynn, and Beverly in women's shoes. The factories of Haverhill on the Merrimac and of Newburyport, which specialize in the making of women's slippers, have close trade relations with the industry in the Boston area.

The shoe industry in Massachusetts is very old. The first skilled shoemakers came to the Massachusetts Bay Colony from England in 1629, and by 1650 the industry was well established. Many farmers made the shoes for their households, and there were itinerant shoemakers who made and repaired shoes; but in most of the large towns, by the latter date, shoemakers had set up small shops, popularly known as "ten footers," where shoes were repaired or made to order for people or for stores. Standardization in size, as we have it to-day, came after a machine, which was invented for turning out gun stocks, was applied to the making of shoe lasts. Americans have always been among the leaders of the world in devising machines for the shoe industry. In 1809 and 1810 several machines were devised for fastening heels to shoes. It was easy to adapt the sewing machine, patented by Howe in 1846, to the sewing of the "uppers" of shoes, but not for sewing soles to uppers. A machine for performing the latter operation was devised by Blake in 1858, and later improved by McKay. Machines of this latter type are still in use in the industry, and shoes made on them are known to the trade as the McKay type. In 1919, about 28.7 per cent of the shoes made in Massachusetts were classed in the trade as the McKay. A welt machine with a curved needle, invented in 1862 by Destary and later improved by Charles Goodyear, has given origin to another type of shoe, known in the trade as the welt or Goodyear. Extreme specializa-

tion, great skill, and numerous machines—in some factories a score or more of different machines are used in the making of a shoe—enable American manufacturers to turn out shoes that are in demand the world over. Shoes are manufactured in about a hundred or more towns in Massachusetts, New Hampshire, and Maine. About 35 per cent of the total for the United States, in quantity, are produced in Massachusetts alone. (Fig. 87.) Associated with the making of shoes are a few tanneries and many leather goods factories and plants engaged in the manufacturing of rubber shoes. The manufacturing of India rubber goods began at Roxbury (now a part of Boston) in 1833, but the industry did not have the greatest growth until the discovery of a method of hardening rubber by sulphur and heat, by Goodyear of Connecticut in 1839.

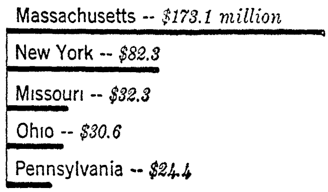


FIG. 87.—Five Leading States in Boot and Shoe Manufacture, 1919.

The industry is spreading westward and southward, but Massachusetts is likely to continue to hold the leading place for some time. Most of the more expensive shoes come from the factories of Massachusetts.

The textile industry in the Boston area, although not so important as in other parts of the Northeastern States, dates from the Colonial period. (Fig. 88.) In 1656 the Colonial Assembly required each family to spin three pounds of woolen yarn each week for thirty weeks each year, under heavy penalty, and in 1640 the magistrates were directed to further the growing of flax, and to provide spinning wheels that the boys and girls might learn to spin wool, flax, and cotton. As a result of these efforts, New England by 1700 was exporting manufactured cloth to the southern colonies and elsewhere. The climate of New England was well adapted to the production of wool and favored the growing of flax; and through the active commerce with the West Indies and India, cotton was supplied the spinners. The first cotton mill in America, it is claimed, was built at Beverly in 1788. Francis Cabot Lowell, after a visit to the textile mills in England, set up the first successful loom at Waltham in 1814. But the Merrimac Valley and the Narragansett

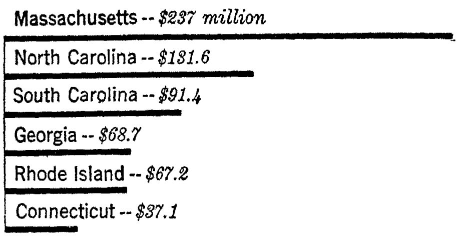


FIG. 88.—Leading States in Cotton Goods Manufacturing in 1919.

Massachusetts is the leading state, but in late years the South is taking the lead over the Northeastern States in active spindles and consumption of cotton.

Bay region have far outstripped the Boston Bay area in the textile industry.

The excellent harbor on which Boston is located, the numerous radiating railroad lines, and the long-time interest in ocean carrying are the chief reasons for the importance of its commerce. Many of the products imported go to the factories of the Boston Bay area and other manufacturing districts of New England. Since the World War, Boston has become one of the most important wool markets of the world, to which buyers come from all parts of the United States and even from Europe. The numerous steamship lines bring wool from all the leading overseas wool-producing countries, and the railroads bring it from the Rocky Mountain States and elsewhere in our country. (Fig. 89.) The manufacturers of goods using wool, therefore, find in Boston a great variety from which to select. The manufacture of chocolate and cocoa products from imported cacao beans is one of the important industries. So also is the preparation of tea, coffee, coconut, and other imported products.

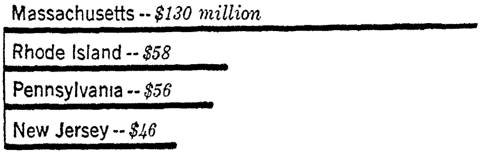


FIG. 89.—Leading States in the Manufacture of Woolens and Worsteds. Value Added by Manufacture, 1919.

The dominance of the Northeastern States in this type of textiles is well shown by the graph.

The making of women's and children's ready-to-wear clothing, which may be considered as the secondary manufacture of textiles, uses large numbers of foreign laborers who work for comparatively low wages. An excellent market for these goods is found in New England itself. (Fig. 90.) The list of minor industries is very large, as one might expect in a region so long engaged in manufacturing. At one time there were iron furnaces at Lynn and Braintree, the one at Lynn having been erected in 1643. Here, for a century or more, agricultural implements and tools, and hardware used in shipbuilding were made. The iron ore came from the glacial ponds and bogs and was smelted by charcoal burned in the nearby forests.

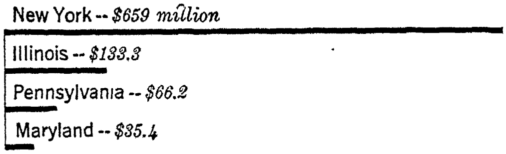
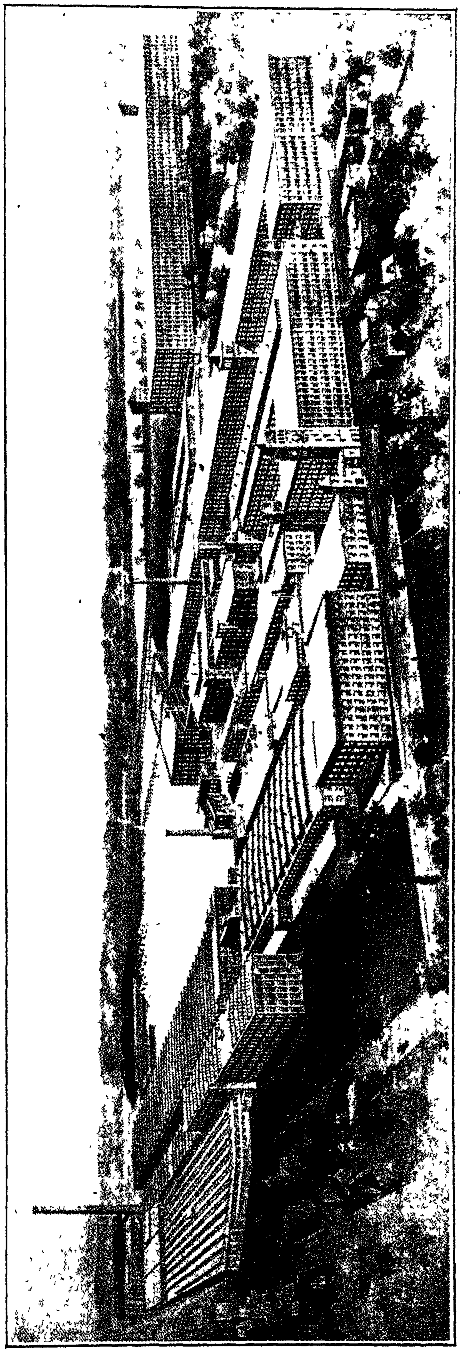


FIG. 90.—Manufacture of Ready-to-wear Clothing. Value Added by Manufacture, 1919.

The leading centers in New York State are New York City and Rochester. While Boston is fairly active in this industry, Massachusetts ranks below the states listed in the graph.

There are many foundries and machine shops in which shoemaking

and textile machinery is made and repaired, besides the great variety of job work necessary in this machine age. Most of the work in metals is in small metal goods and jewelry, electrical apparatus, and copper and brass. Waltham has one of the largest watch factories in the world, and, it is claimed, turns out about a million watches a year.



Courtesy Arlington Mills.

FIG. 91.—A Worsted Goods Mill at Lawrence, Massachusetts.

This company began the manufacture of woolen goods in 1865 at Lawrence. The Tariff Law of 1867 aided the worsted goods industry and owing to the greater profits to be made the woolen mills were turned into worsted plants. Little was known of the manufacture of worsted goods in this country at that time. Skilled workmen had to be developed.

The Merrimac Valley Area.—Textile manufactures, which dominate in the Merrimac Valley area, had their beginning in the city of Lowell. A Waltham, Mass., company purchased a power site at Pawtucket Falls on the Merrimac about 1820, and erected a large cotton mill, about which the village, and later the city, of Lowell grew up. The mill vil-

motives at Manchester, needles in some towns, and silverware at Newburyport. Foundries and machine shops, as in the Boston Bay area, are numerous. At Portland, Me., there are many foundries and machine shops, some textile mills and shoe factories, and plants for canning and preserving vegetables and fruits.

The Narragansett Bay Region.—Although the manufactures of the Narragansett Bay area are varied, the textile industries predominate. It was at Pawtucket, on the Blackstone River, that Samuel Slater built his first cotton mill of 250 spindles in 1793. During the latter half of the eighteenth century there had been many epoch-making inventions in textile manufacture in England, by Kay, Hargreaves, Arkwright, Compton, Cartright, and others, but Parliament had prohibited the exportation of any of the machines or even the drawings of them. Samuel Slater, who had worked several years in textile-machine factories and had made himself familiar with the parts and the operation of the Arkwright spinning machines, migrated to America and, with the help of Rhode Island capital, built the first modern cotton mill in America. About all that Rhode Island offered as an inducement to the industry was capital and a limited amount of water power. Wool was obtained from Rhode Island or Massachusetts flocks. Cotton, for a few years after the completion of the Pawtucket mill, was brought from India or the West Indies, Providence being the port of entry. Success from the first met this new venture and the textile industry soon began to draw much of Rhode Island capital into it. From Pawtucket the textile industry spread up the Blackstone, every waterfall or rapids becoming the site of a textile town, even on into southern Massachusetts. Pawtucket, Central Falls, and Woonsocket to-day are the larger textile centers. The valley of the Pawtuxet River, to the southwest of Providence, also has many textile towns, and the industry has expanded on into eastern Connecticut along the Quinebaugh and other branches of the Thames. The chief cities in the latter valley are New London, Norwich, Willimantic, Webster, and Southbridge, the last two being in southern Massachusetts.

In this expansion along streams, state lines were no barriers to the textile manufacturers in their zeal to find power sites. The limited amount of water power at many falls or rapids has somewhat retarded factory growth in comparison with that at ocean ports like New Bedford and Fall River which receive western Pennsylvania coal from the Delaware and Chesapeake Bay shipping points. All the early mills were erected at power sites on the river, the later ones near the sea. Power, therefore, has been an important factor in localization although the shore climate has had some attractions. There is a surprising con-

centration of spindles in southern Massachusetts. Bristol County, which contains the three large textile cities of New Bedford, Fall River, and Taunton, had in April, 1923, 6,719,722 spindles, or more than one-fifth of the total for the United States.

The Narragansett Bay region manufactures both cotton and wool goods (woolens and worsted). New Bedford, Fall River, and Pawtucket are predominantly cotton towns. Providence produces some wool goods, as do also many of the towns in the Quinebaugh Valley. Pawtucket's interests are largely in cotton and silk, but Woonsocket, while producing these goods, is most active in the manufacturing of woolens and worsteds. The manufacture of goods from wool dates from Colonial days, and many mills have developed from early carding and fulling mills; but the worsted industry in America dates from the 1860's when a tariff on imported worsteds was passed by Congress and skilled workmen from Europe were brought to America. The manufacture of worsteds calls for large plants and very costly machinery. The industry is widely scattered in the Northeastern States; besides the cities already mentioned—Lawrence, Manchester, and Woonsocket—woolen mills are found at Fitchburg, Worcester, and many smaller places.

Most of the textile mills of the Narragansett Bay area are complete in themselves and perform all the processes from raw products to finished goods, but there are plants given over exclusively to spinning, weaving, bleaching, dying, or finishing. Associated with this great activity in textile manufactures are foundries and machine shops.

The manufacture of jewelry ranks next to that of woolens and worsteds at Providence, in value of product and value added by manufacture. Like many of the industries of the Northeastern States, and particularly of New England, this industry is an old one, dating from about 1780. "Gold filling" was invented by Dodge of Providence in 1794, and the manufacture of silverware was begun soon after the Revolutionary War. Skill in workmanship and a reputation for good wares have kept Providence in the lead in jewelry manufacture.

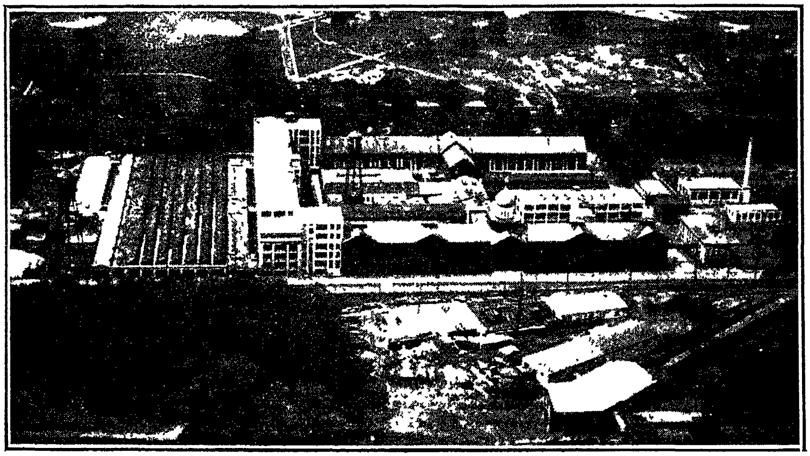
Diversified Industries of the Connecticut Areas.—Since late Colonial days, Connecticut has been producing clocks, watches, tinware, small metal goods, and "Yankee notions." When transportation was still in its primitive stages in America, peddlers with push carts visited the farmers along the waysides of Connecticut and other nearby states and supplied them with much-needed household articles. In the early part of the nineteenth century, Connecticut clocks and other articles were sold in the farming communities and small villages and cities of the North Eastern States and even the Middle West and the South. To-day something like 1200 articles are manufactured in Connecticut.

The textile mills are widely scattered in Connecticut and in the Connecticut Valley in Massachusetts. The manufacture of silk began in 1732. Mansfield had a factory in 1758. Cheney Brothers began the manufacture of spun silk at South Manchester in the 1840's. To-day South Manchester in Connecticut and Northampton in Massachusetts are the leading centers. The dominant reasons for the localization of silk factories in these towns are early interest in the making of textiles, the presence of skilled textile workers, clean water, and water power. The activity of New England in the carrying trade with India and the Far East in the Colonial period made the securing of raw silk at low prices possible.

There was a small woolen factory at Hartford in 1788; to-day, mills are found at Hartford, Norwich, Rockville, and many small towns on streams that furnish water power. Danbury, in western Connecticut, is interested in the making of hats and caps and the machinery for manufacturing these articles. The mills at Pittsfield in western Massachusetts began when sheep were numerous on the Berkshire Hills. The large amount of water power available at Hadley Falls at Holyoke, where the Connecticut falls 60 feet in $1\frac{1}{2}$ miles as it descends from the crystalline uplands to a broad valley, gives the city a decided advantage in the making of pulp and paper. It was not until about 1849 that the engineers felt competent to harness a large falls. A dam 1017 feet long was constructed that year, and a large amount of water power, 40,000 H.P. in all, was developed along the numerous canals that led away from the river above the falls. Cotton goods were the first manufactured products of Holyoke, many small power sites being utilized; but to-day Holyoke leads all cities of the United States in the manufacture of fine paper. Holyoke, with its large plants equipped with large pulp grinders and Foudrinier paper machines, was soon able to outstrip the numerous smaller plants at small water-power sites on the slopes of the Berkshires. At one time the Housatonic River Valley in Massachusetts had more than a score of plants; one town, Lee, had eighteen; but the smaller plants have not succeeded in competition with the larger, and now there are fewer pulp and paper mills than formerly but a greater output.

The southwest Connecticut and Connecticut Valley region, however, is most active in the manufacture of firearms, brass and bronze, clocks and watches, plated ware, cutlery, and metal "specialties" of various sorts, as earlier stated. At New Haven, Bridgeport, Hartford, New Britain in Connecticut, and Springfield in Massachusetts, foundries and machine shops are the leading plants, and metal goods are manufactured at many other industrial centers. (Fig. 93.) Rogers Brothers began the making of cutlery in 1847 at Meriden, and this led to the

establishment of "plating" plants at Waterbury, Norwich, and Hartford. The making of brass buttons at Waterbury led to the plants turning out brass, bronze, and copper products, which are very active in the Naugatuck Valley to-day. Hartford at one time was one of the leading cities of the country in the manufacture of bicycles. It now manufactures automobile bodies and accessories. Firearms lead the foundries and machine shop products of Springfield; and firearms and sewing machines those of Bridgeport. The manufacture of firearms at Springfield dates from the Revolutionary War period, an arsenal having been established here by the Continental Congress. Springfield small



Courtesy Colt Manufacturing Company.

Fig. 93.—Plant of the Colt Manufacturing Company, Hartford, Connecticut.

At this plant the Browning machine guns and automatic rifles were invented and manufactured. Here also Vicker's machine guns, automatic pistols, and revolvers were produced for the Allied Nations in the World War. The plant is now turning out several models of a machine for washing tableware and metal parts, a line of electrical goods and radio parts, and various articles made from bakelite and phenolic compounds Its products typify Connecticut Yankee ingenuity.

arms have long been famous. There seems to be no outstanding geographic reason for the prominence of small metal goods in the industries of this region. At one time, namely, before the Revolutionary War, the manufacture of pig iron and iron goods was active, the ore being obtained from deposits in northwestern Connecticut. The lack of coal for fuel and power has forced New England in general to an intensification of manufactures in the competition with western Pennsylvania. Many important inventions have been made in this region and these have contributed greatly to the interest in manufacturing. Connecticut clock makers have long been noted for their ingenuity. Eli Terry was a famous maker of wooden clocks; Jerome in 1837 conceived the idea of

using brass wheels; and at Thomaston for many decades the famous Seth Thomas clocks have been manufactured. It was in this region that Howe and Wilson devised the sewing machine, and here Charles Goodyear, after many years of thought and experimentation, perfected the process of vulcanizing rubber, and Colt began the manufacture of the Colt firearms. Eli Whitney, whose cotton gin made cotton the leading textile fiber of the world, was a Connecticut Yankee. From no other region in the United States have inventors taken out so many patents. Thus, all along, the boys of this region have had schooling in ingenuity. Many fortunes have been made by perfecting some article in great demand, and this in itself has been inducement enough for men to become inventors and manufacturers of the articles devised.

Still another factor, non-geographic, that has been of great importance is the Joint Stock Act, adopted by the Connecticut Legislature in 1837, whereby men with small capital were permitted to pool their holdings and thus join forces in manufacturing. This act has since been adopted by all the states of our country, by Great Britain, and by most other manufacturing countries.

The Connecticut region has always had good transportation facilities, as good as any in America, a good supply of labor, and much capital. Its metal manufactures call for little raw material and little coal, but much skill.

The Mohawk-Hudson Area.—The industrial area along the Mohawk owes its development to several factors. Shortly after the valley was settled, small mills for the sawing of lumber, the grinding of grain, or the pressing of flax seed were set up along the numerous small streams that flow down the slopes of the bordering uplands; but these, after engineers had gained experience in building large dams, were overshadowed by the large developments at Little Falls, Cohoes, and elsewhere. And when manufactures outgrew the available water power, railroads began to bring coal to the factories from both the anthracite and the bituminous regions of Pennsylvania. Since the opening of the Erie Canal in 1825 the cities have had the best of transportation facilities to collect raw materials and get their products to buyers. The earliest railroads of New York were constructed westward from Albany. Although the Barge Canal, with its 12 feet of water and locks 310 feet long and 45 feet wide, and its annual capacity of 20,000,000 tons, is little used at present, it forces the railroads to give minimum rates to the factories.

Troy is famous for its collars and cuffs; and Cohoes, near the mouth of the Mohawk, is the greatest center in the United States for the manufacture of knit goods. Schenectady has large locomotive works and is the home of the General Electric Company, one of the largest manu-

facturers of dynamos, motors, and electrical appliances in America. Among the other industries at Schenectady are those producing hosiery and knit goods, hardware, paints and varnishes, fire engines, and agricultural implements. Carpets and knit goods are made at Amsterdam, and cotton and woolens at Utica and Johnstown, and Gloversville manufactures most of the gloves worn in the United States. Rome, on the divide between the Hudson River and Lake Ontario, produces brass and iron goods.

The Industries of Syracuse.—Syracuse, farther west on the border of the lake plains, ranks fourth among the manufacturing cities of the state. Many of the factories are supplied with hydroelectric power from Niagara Falls. The principal products of its factories are automobiles, foundry and machine shop products, ready-made clothing, iron and steel products, typewriters, sewing machines, shoes, and agricultural implements.

The Syracuse region early became known to Europeans because of the salt deposits. Long before the Revolutionary War, the Indians evaporated brine and sold salt to the whites at Albany. In 1795 the state purchased the salt lands of Onondaga County from the Indians and encouraged the production of this most necessary article. Onondaga salt had a wide market until the opening of great deposits in Michigan. The salt deposits in the late decades have become the basis of a large chemical industry, the largest plant in America for the production of soda-ash being at Solvay, a suburb of Syracuse. The method of manufacture is called the Solvay process.

The Industries of Rochester.—Flour milling was the first industry at Rochester, the abundant water power of the Genesee—there are three cataracts with 96-, 36-, and 83-foot drops, respectively—being used to furnish the energy. After 1825 the Erie Canal gave ready access to eastern markets. Flour milling is still active, but the city's largest industry to-day is the making of men's clothing which finds a market over most of the United States. The making of shoes and leather goods holds second rank, and foundry and machine shop products third. Rochester is widely known as the " Kodak " city. In the manufacture of photographic apparatus and supplies, moving picture supplies, meteorological apparatus, and optical goods, such as telescopes, opera and field glasses, it probably holds first rank among the cities of the world. It also manufactures much electrical apparatus and machinery.

The Buffalo–Niagara Falls Area.—The industries of Buffalo, in the Buffalo–Niagara Falls area, owe their development largely to their being at the eastern terminus of the Great Lakes, near the coal, oil, and gas fields of western Pennsylvania, and to their having excellent transporta-

tion facilities to the eastern markets by way of the Erie (in past) and Barge canals or the numerous railroads.

Commerce is one of the chief activities of Buffalo, this city being a distributing center for the manufactures of the East seeking western markets, and for the products of the forest, field, and mine on their way to the East. This close touch with producing regions and markets gives the industries of Buffalo a decided advantage. Its chief industries are flour and grist mills, linseed-oil plants, slaughtering and meat-packing plants, mills turning out lumber and timber products, shops making cars and railroad equipment and repairs, and laboratories making patent medicines, chemicals, and soaps. There are also copper smelters and refineries, petroleum refineries, dry docks and shipyards, and a large steel plant of the Lackawanna Iron and Steel Company.

Tonawanda, to the north, the eastern terminus of lake navigation, is an important lumber center; and at Niagara Falls there has grown up, since the construction of several hydroelectric plants, an important electrochemical industry. Chemicals are the chief manufactured products of the city of Niagara Falls. At many of the smaller towns in northwestern New York and at some of the large cities—mainly outside the Buffalo–Niagara Falls area,—there are large plants for canning and preserving fruits, and bottling grape juice, the raw materials coming from the nearby fruit region. (Also mentioned elsewhere.)

The Varied Industries of the New York–Philadelphia Area.—The area that lies between New York City and Philadelphia, inclusive, is the most important manufacturing section in the United States, judged from the value of the output of the factories and the value added by manufacture. More than one-sixth of the manufactured products of our country, in value, come from this area. It is not a region producing large quantities or a variety of raw products. There is little or no water power, no coal, oil, or gas. Its chief asset is its location near the center of the habitable coast of North America on the western border of the most important commercial ocean, the Atlantic, at the eastern termini of the best traffic routes across the Appalachian Highlands, and near large deposits of excellent coal. The output of its factories is varied. Indeed, it would be difficult to think of many articles not manufactured in this region.

The Importance of the New York City Area.—Chief among the manufacturing cities of this area is New York. Although commerce is one of the major activities of the city of New York,[3] the output of the factories in 1919 amounted to $5,261,000,000. This was about five-eighths of the total

[3] The water commerce of the port of New York, which includes parts of New Jersey and New York State, in 1921 was valued at $16,241,000,000.

of the State of New York, and one-twelfth of the output of the factories of the United States. The output of the factories of New York City in 1919 was nearly as great as that of all the factories of the United States in 1880. It was the Erie Canal, and later the railroads that gave access to the interior of the United States, the large number of immigrants who landed at the port of New York, and the expansion of overseas commerce, that have made New York City, since the middle of the nineteenth century, the largest manufacturing center of our country.

The most important industry is the making of men's and women's clothing, representing more than a quarter of the total output of the factories of the city in value or in value added by manufacture. This industry is carried on largely in smaller shops, and its importance is due largely to the abundant supply of foreign labor and the large market. The value of the output of the clothing industry amounts to $1,250,000,000 a year. Other related products are millinery and lace goods, fur goods, men's shirts, silk goods, and men's furnishings.

In the printing and publishing of newspapers, magazines, and books, New York leads the cities of the country. Among other industries and plants are slaughtering and meat packing, bakeries, confectionery and ice cream plants, and foundries, and machine shops.

The Industries of Northern New Jersey.—The cities of northeastern New Jersey, on or near the Hudson River and the bays—Upper New York, Newark, and Raritan—are really a part of geographic New York, and their growth is due to many of, if not most of, the same causes. Farther south, toward Philadelphia, the cities share many of the advantages for growth that have made Philadelphia, the third manufacturing center of the United States, in value of product. The narrow strip of territory between the Hudson and the Delaware in New Jersey has about four-fifths of the people of that state and nearly all the manufactures.

In value of product the five leading types of manufactures in this area are the refining of copper, the refining of oil, the building of ships, the making of silk goods, and slaughtering and meat packing; but, based on value added by manufacture, the list of products in order of importance is ships, silk goods, refined oil, rubber tires, rubber goods, phonographs and graphophones, and leather.

There are large shipyards at Elizabeth, Bayonne, Jersey City, and Camden, at which both wooden and steel ships are constructed. Paterson, the "Lyons of America," owes its prominence chiefly to the success of early attempts at the manufacture of silk cloth and floss, which was first begun here about 1840. Coal fields are near, as are also excellent markets, but the raw silk is imported from the Far East or Mediterranean regions. There are about 570 plants interested in the man-

ufacture of silk goods, in most of which all phases of manufacture are carried on; but 53 plants (in 1919), in addition, are engaged in the dyeing and finishing of textiles, chiefly silk. Elizabeth and Bayonne have the immense petroleum-refining plants of the Standard Oil Company, that at Elizabeth covering more than 800 acres, with distilleries and refineries, laboratories, tanks, and warehouses, at which crude oil from all the fields of the United States east of the Rocky Mountains, even from Oklahoma and northern Texas, is separated into scores of products for home consumption or export. Bayonne has immense docks for receiving crude petroleum from foreign fields or loading the tank vessels with export products. The value of the output of the petroleum refineries of New Jersey was $281,000,000 (in 1919), and the value added by manufacture in these plants, $58,000,000. The advantages for overseas shipping and the proximity to large domestic markets are undoubtedly the chief geographic reasons for the localization of oil refining on the shores of New York Bay and connecting waters. Not a drop of crude oil is produced in New Jersey.

Advantages in the importation of crude rubber from Brazil and from the very important sources of supply in the East Indies, the large local markets, access to large, more distant markets, and activity in the chemical industry are all favorable to the production of rubber tires and rubber goods. It is difficult to explain the localization of the manufacture of phonographs and graphophones in New Jersey, except that the early discovery of the principle involved was made by Edison (in 1877) at his laboratory at Menlo Park near East Orange. Camden and Newark have many phonograph factories. This is probably the most lucrative industry of the state, the value added by manufacture being $34,759,000 while the value of the product was $55,400,000. The rapid expansion of the radio-equipment industry has cut into the sales of these companies greatly and has forced some of them to make wonderful improvements in their instruments.

The tanning industry at Newark dates from about 1770, when hides derived from local slaughtering houses were tanned with oak and hemlock bark from New Jersey forests. Now hides may be imported readily or secured from the slaughtering houses of New Jersey or New York or Chicago; but the tanbark must come largely from the distant forests of the Appalachian Highlands or be imported. Much tanning extract is now used.

The refining and smelting of copper, which stands first among the industries, when value of product is considered, is carried on chiefly at Camden and Newark. It probably had its beginning in the treatment of the copper ores mined in the Piedmont in the state; but the refineries

and smelters to-day treat large quantities of ore from our Western States as well as from Mexico, Bolivia, Peru, Chile, and elsewhere. Pennsylvania furnishes the fuel. The value of the output of this industry was more than $244,269,000 in 1919, yet, according to census data, the value added by manufacture was but $12,855,000. The state still produces small quantities of copper ore; and zinc, once very important in its output, is now mined, although in small quantities, at Franklin Furnace. Platinum, nickel, gold, silver, zinc, and lead are also treated in New Jersey metallurgical works, the more important of which are at Elizabeth. The manufacture of iron began in 1674, with ores mined near Shrewsbury. The interest in this industry is attested by the fact that one of the inventors, at Newark, devised a machine for making nails, made several improvements for locomotives, and discovered a method of making malleable iron. Magnetite is still mined in small quantities, and several cities have iron and steel works.

The above types of industries are only a few of the more important. Numerous foundries and machine shops are to be found in all the cities. as well as textile factories. Camden manufactures cotton and worsted goods; Passaic, woolens and worsteds; New Brunswick, hosiery, The Singer Sewing Machine plant at Elizabeth is one of the largest, if not the largest, in the world. Felt hats have long been made at Newark, and Orange and Jersey City refine both cane and beet sugar, the raw sugar coming mostly from Europe and the West Indies. The clay deposits near Trenton gave an early impetus to the pottery industry, although ball and flint clays and kaolin are now imported from other states or from overseas. Many brick plants in northeastern New Jersey find a good market in New York City and other urban centers. Pennsylvania coal supplies the great heat necessary in the manufacture of pottery at Trenton, brick in many cities, and glass at Glassboro and Millville. The last two cities are on the Coastal Plain in southern New Jersey near large deposits of sand suitable for the making of glass.

Philadelphia and Vicinity.—Philadelphia has a slight advantage in manufacturing over New York in having easier access to both anthracite and bituminous coal fields. The first canals and canalized rivers constructed in Pennsylvania connected Philadelphia with the Schuylkill and Lehigh coal fields. The Lehigh River was improved about 1822, and soon after "arks" loaded with coal floated down to the state's metropolis by way of the Delaware. Franklin, as early as 1770, advised the construction of a canal along the Schuylkill, but nothing was done toward utilizing this water route until 1822 when $1,000,000, a tremendous sum for that day, were appropriated and coal began to move downstream in 1825. The Pennsylvania Canal, which was completed in

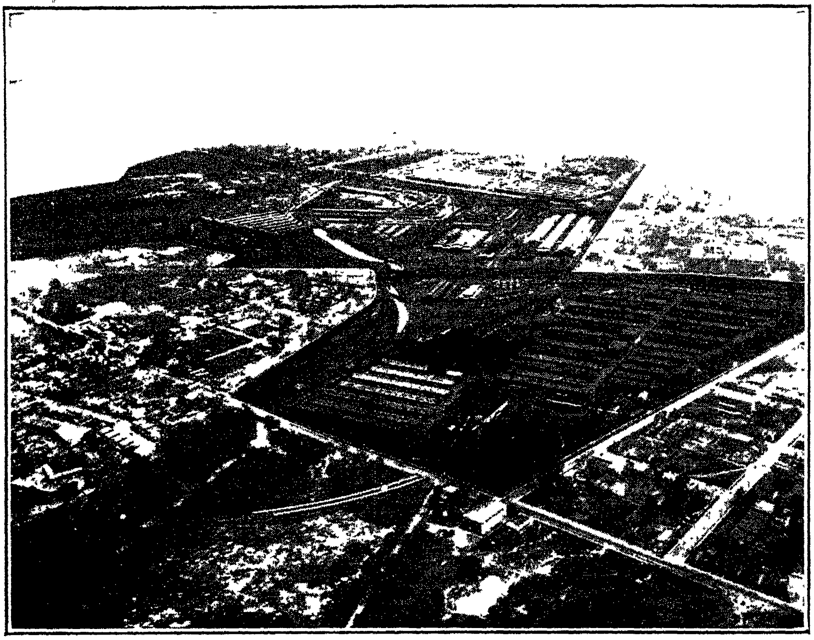
1830 and in operation only about two decades, and the Pennsylvania Railroad, constructed in the 1850's, put Philadelphia in touch with the bituminous fields of western Pennsylvania. Philadelphia is also an ocean port, but its contact with the great North Atlantic trade route is not so close as that of New York, nor does it have so low a land route across the Appalachian Highlands. It was chiefly this better route across the Highlands that enabled New York to forge ahead of Philadelphia in the last century or more in population growth, and eventually in growth in manufactures.

As with Boston, Providence, and some cities of Connecticut, many of the present-day industries of Philadelphia and the nearby towns had their start in Colonial days. The manufacture of hosiery and knit goods was begun by German colonists shortly after 1680, hand looms being used. " Germantown woolens " were well known throughout the Middle Atlantic settlements. The first active manufacture of iron in the state was at Pottstown, some 30 miles from Philadelphia in the Schuylkill Valley, probably as early as 1716. The woolen industry of the city was greatly aided during the Revolutionary War by the large orders given for uniforms for the Continental Army. Carpet weaving was begun in 1774.

In value of product, sugar refining is the leading industry of Philadelphia. This city possesses, as do all Atlantic ports, good facilities for the importation of raw sugar, and can command a large domestic market. In value added by manufacture, this industry ranks very low.

The weaving of woolen goods, carpets and rugs, and cotton goods and silks, and the making of men's and women's clothing all rank high among the industries and owe their importance to their long standing among the industries of the city and to the good transportation facilities for collecting raw materials and distributing the manufactured articles. Cramp's shipyard and the Federal Government yard at League Island, at which many of the vessels for our navy are built and equipped, are famous. Philadelphia's yards launched many of the finest of the clipper ships in the decades when these swift vessels made America famous on the world's oceans. The Baldwin locomotive works have for decades been producing the best of American locomotives. (Fig. 94.) Their superiority over foreign makes is indicated by the large orders from all parts of the world where railroads are opening up undeveloped regions to world commerce. Thus Philadelphia makes its contribution to both sea and land transportation. Stetson hats, Disston and Keystone saws, *The Saturday Evening Post*, and Philadelphia tools typify other leading industries. (Fig. 95.)

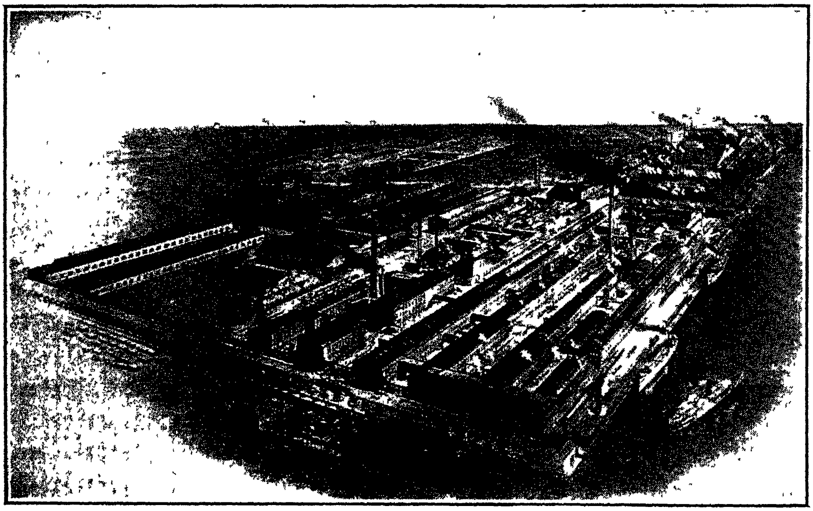
The leather industry is very old but received its greatest growth about



Courtesy of Baldwin Locomotive Company.

FIG. 94.—Aeroplane View of Baldwin Locomotive Works, Philadelphia.

The contributions of the Baldwin Company to transportation and consequently to the economic, political, and social life of America is almost immeasurable. Baldwin locomotives are in use on many railroads in other countries.



Courtesy of Henry Disston and Sons.

FIG. 95.—A Saw and Tool Plant at Philadelphia. (Architect's Drawing.)

The size of the plant is indicative of the size of the market it serves.

the time of the Civil War, when the decline of the forests of New York made an imperative call for tanbark, and Pennsylvania ridges with their dense oak forests were able to supply the demand. By 1889 Pennsylvania had one-fifth of the tanneries of the United States. Although the Northern Appalachian forests have long since been depleted of their tanning materials, the use of tanning extracts and a monopoly of a chemical tanning formula have enabled Pennsylvania to hold its lead among the States. Philadelphia is the leading city.

Chester, to the southwest of Philadelphia on the Delaware, has rolling mills and steel works and shipbuilding, and has long been interested in the textile industry, the making of cotton and worsted goods and artificial silk.

The valley of the Schuylkill, when coal was the chief fuel used in iron making in Pennsylvania, was once the seat of an active iron industry in this valley.

Industrial Symbiosis in Eastern Pennsylvania.—There are plants in eastern Pennsylvania making iron and steel castings, builders' hardware, iron pipes, and textile-mill machinery. These call for male laborers, while the numerous factories employed in producing knit goods or in dyeing and finishing textiles give work to the more delicate hands of women. (Fig. 96.) Most of the workers, male and female, are foreigners. This "symbiosis" in industrial types is repeated in nearly every one of the cities in or near the anthracite regions of the state. Scranton, in the Lackawanna Valley in the Wyoming field, is interested in producing locomotives, mining machinery, and many other iron and steel products, and also woolens, cottons, laces, and buttons. Wilkes-Barre, also in the Wyoming field, has machine shops, forged axle and wire rope works, and also has silk and lace mills. Allentown in the Lehigh Valley, which leads out of the Lehigh coal fields, has iron furnaces, rolling mills, foundries, shoe factories, and cement plants, and also silk and knitting mills. Bethlehem has the great Bethlehem steel works which produce armor plate, steel rails, machinery, and castings of many sorts. In the city or nearby towns there are cement plants, brick yards, and automobile works, as well as silk mills and ribbon factories. Easton, also in the Lehigh Valley at its junction with the Delaware, produces cement, pig iron and steel, pneumatic tools, mining and

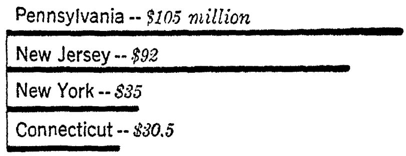


FIG. 96.—Silk Goods Manufactures: Leading States in the Production of Silk Goods. The total for the United States in 1919 was $300,000,000.

hydraulic machinery, chemicals and paints, and also silk goods, cotton yarn, and hosiery. Hazleton manufactures mining machinery, pumping machinery, pianos, and other products demanding the labor of men; and also silk, hosiery, knit goods, overalls, and other goods which may be made by women and children. At Norristown, Harrisburg, Steelton, and other cities, the same conditions as to labor demands exist.

Smaller Industrial Centers in Pennsylvania.—The industries of Lancaster and York bear a closer resemblance to those of New England than to the industries of the cities just discussed. Lancaster has a watch factory, a linoleum plant, a toy factory, and plants producing small metal goods, such as jeweler's tools, padlocks, and ball bearings. The textile products are cotton and silk. York makes agricultural implements, tobacco and cigarettes, paper products, a wall finish of excellent quality, leather goods and textiles, as well as a few heavy articles, such as ice-making machinery, sawmill equipment, chain and wire, and locomotives.

Altoona, at the eastern foot of the Allegheny Front near a low gap in this mountain wall, is a small industrial center standing quite alone in a large area of agricultural and forest lands. It is largely the creation of the Pennsylvania Railroad which has here its largest shops. It is near the eastern edge of the bituminous coal area. Other industries are silk mills, iron works, and brick yards, the localization of the latter two being due to nearby deposits of clay, as well as fuel.

Iron and Steel in the Pittsburgh Area.—The industrial region of western Pennsylvania is dominated by Pittsburgh, the "Iron City"; and the industries of most of the cities of the area are but reflections of those of the major city. The abundance of fuel—coal, oil, natural gas—with a few raw materials such as glass sand and iron ore, or easy access to iron ore, have from the first been factors favoring the localization of the iron and steel industry. The position of Pittsburgh, at the junction of the Monongahela and Allegheny rivers and at the head of the Ohio, enables it to collect raw materials by water from the north and south, the rivers having been improved for some distance from Pittsburgh—91.5 miles on the Monongahela. In the settling of the Ohio Valley, Pittsburgh was the port of embarkation for the flatboat journey down the Ohio and afterwards the farmers looked to the city to fill their needs for manufactured goods. Until the completion of the Pennsylvania Canal and Portage Railroad and, later, the Pennsylvania Railroad, transportation across the Highlands was so expensive that Pittsburgh or the surrounding region was called upon to produce most of the manufactured goods used in the Ohio Valley. An iron furnace was erected near Uniontown about 1790, using local iron ore and charcoal. Hollow ware

and other articles needed on the frontier were made. By 1806 the manufacture of iron was well begun. The first rolling mills were built in 1812. Iron came to dominate the industrial life of the city after about 1825. The greatest development followed the use of Connellsville coke and, later, the use of the rich ores of the Lake Superior region. It has been found that coal other than that at Connellsville will make coke suitable for iron smelting, and that the southern lake ports are as well located for the meeting of iron ore and fuel as the forks of the Ohio; yet the large amount of money invested in blast furnaces and steel mills that would have to be sacrificed if plants were moved enables Pittsburgh to hold its place as the greatest iron-producing city in America. From the industrial nucleus at the forks of the Ohio, city after city has grown up along the Allegheny and Monongahela, along the Ohio, and even along Beaver River northward toward Lake Erie. Johnstown on the Connemaugh, to the east of Pittsburgh, has a coal, iron, and steel industry. Most of the ore comes from Lake Superior.

About one-third of the factories of the city of Pittsburgh are engaged in producing iron and steel and products of steel works and rolling mills; the total value of the products of blast furnaces, steel plants, foundries, and machine shops is one-half the total for the city. Nearly all the iron products of the Pittsburgh area are "heavy" iron and steel goods, in which the amount of material, rather than the amount of skill or labor, largely determines the value. The Westinghouse air brakes have been furnished by Pittsburgh to a large part of the railroad cars of America, and Westinghouse electrical apparatus is well known. Some work is done in brass, bronze, and copper. The making of glass dates from 1797, the industry being first localized here because of the abundance of glass sand; its later expansion was due to the large stores of natural gas, which is both a cheap and an ideal fuel in glass making. The city being a railroad center, there is a call for locomotives, cars, and general railroad repairs.

QUESTIONS, EXERCISES AND PROBLEMS

1. Is it environment or man that has made the Northeastern States the greatest manufacturing region in our country? What are the natural geographic conditions? Did the Europeans who settled this section bring with them European inheritances and experiences that contributed to the great industrial development?

2. Is it environment or man that keeps New England a manufacturing section?

3. Make a list of twenty-five of the largest cities of the United States. What percentage of the total number is in the Northeastern States? What percentage of the total population of the twenty-five urban groups is in the urban groups of these states?

4. How are New England manufactures affected by the lack of local coal deposits?

5. Make a detailed study of New York as a type port. Consider depth of water, extent of shoreline, protection from winds and waves, contact with interior United States and the world oceans, Government improvements and aids to navigation, warehouses and facilities for transfer of cargoes, and other items.

6. Many of the large manufacturing companies operating in these states publish excellent booklets that will furnish much basic material for the working out of excellent type studies. The following is a list of possible studies that are typical of the industries of these states: the Pennsylvania Railroad, the Hammermill Paper Mill, the Baldwin Locomotive Works, the Connellsville Coke Region, the Douglas Shoe Factory, the Arlington Mills, Lawrence, Mass. Each of these may stand as a type of industry. Emphasize geographic relationship.

7. What contribution to the settlement and the economic and commercial life of the United States has the coal of Pennsylvania made?

8. The petroleum industry had its start in Pennsylvania. Trace out the far-reaching influences that petroleum has had in the past, and has to-day, on American social and economic life.

9. How have climatic and geologic forces and processes given the Northeastern States large resources of water power? Consider each section of these states separately.

CHAPTER VII

THE FISHING INDUSTRY IN THE NORTHEASTERN STATES

Introduction.—In 1784 the Massachusetts House of Representatives voted to have hung in the session room a "representation of a codfish . . . . as a memorial of the importance of cod fishing to the welfare of the Commonwealth." It hung there until 1895, when, after a careful investigation of its history and in accordance with a vote, it was removed to the new chamber, where it may be found to-day, "an emblem significant of the hardiness, courage, and faith of those who dare and defy. . . ."

Fishing was the first American industry, antedating even the first settlements. Indeed, it was chiefly the fisheries off northeastern North America that led to its settlement. Within six years after the discoveries of the Cabots, the ships of the French fishermen from Dieppe and St. Malo visited the banks of Newfoundland. By 1517, vessels of many nationalities—French, Portuguese, Spanish, and English—to the number of 50 and, by 1577, 315, crossed 2000 miles of stormy sea to take the cod.

The first fishing voyage to the coast of what is now the Northeastern States was made by Gosnold in 1602. He it was that named Cape Cod as a memorial to the "luck" he had near its stormy shores. His glowing accounts of the richness of the fisheries and the evidence he presented interested several merchants and fisherman. In 1607, cabins, a storehouse, and a small fort were built near the mouth of the Kennebec River as a base for fishing on the Maine coast. The first ocean vessel launched in America was built here and subsequently made several voyages across the Atlantic.

Before the Leyden Pilgrims landed at Plymouth, English, French and Dutch fishermen, had become fairly well acquainted with the northeastern coast of the United States. During the six years before 1620, 26 vessels had fished on the coast with great success; and by 1624 from 40 to 50 vessels from England visited the fisheries yearly, and fully 250 sails, employing 5000 persons, operated on the Newfoundland Banks. Fishermen, therefore, opened the way across the trackless ocean for settlement, and fish was the first natural resource of the American continent to be exploited by Europeans.

Many of the early settlements of New England were planted to exploit the fisheries, and fish on more than one occasion kept the colonists from starvation. Fish, furs, and timber were the first products carried to Europe to purchase the necessities that could not be had in America. The very nature of the industry, as carried on in the early days, bred democracy, for the fish were free for the taking, and, until large vessels came to be built, almost anyone, or at the most a small group of men, could provide themselves with the necessary appliances. The colonists, therefore, opposed all attempts on the part of the English Crown or the colonizing companies to establish fishing monopolies; and, no doubt, it was this same spirit of democracy, bred by nearly two centuries of free life on the sea in the fisheries and in ocean trade, combined with the fact that the sea was the chief basis of their economic existence, that led the New Englanders to defy the British Government in its attempts at the enforcement of the Navigation Acts of 1672 and 1696, the Molasses Act, the Sugar Act of 1764, and other acts that had for their aim the destruction of American fisheries and commerce. Within a month after the passage of the last of these acts the Revolutionary War began.

There are many reasons for the long-continued dominance of the fisheries in the economic life of the Northeastern United States, and particularly of New England. Fishing to-day is relatively unimportant, when compared with the other economic activities of these states; but for two centuries or more, a young man had few opportunities, other than those on the sea, open to him.

Geographic Factors Favoring Fishing.—We have seen the ill effects of glaciation on agriculture in New England. The meager opportunities in agriculture kept many people in the fisheries. Many of the earliest settlements were made by fishermen, it is true; but had the land offered the inducements that it did farther south, the hard life of the fisherman would have been abandoned by many for the easier and safer life on the land. Many a farmer was forced into winter fishing that he might have food enough to meet the needs of his large family. The long, cold winters gave the farmer a long "off season" for fishing; and the short, mild summers restricted the growth of crops.

The high latitude of the region and the cool Labrador current gives cool waters, the natural habitat of a large number of edible fish known to Europeans and Americans. Fish from cool or cold water undoubtedly have firmer flesh and are more palatable than those from warm water; moreover, there is less danger of putrefaction, and the latter condition was an important factor in localization before ice came to be used so generally. Ice was not used by vessels to preserve fish on the journey

from the banks to the markets until about 1840. Now it is considered a necessity.

Geologic forces, previously described, gave New England many excellent harbors for the sheltering of vessels, the curing of fish, the mending of nets, and the repairing of vessels. From Cape Cod Bay northward the coast is rocky, with deep inlets rocky headlands, islands, and sheltered coves. Southward, even to the tip of New Jersey, the shore is sandy, with shallow bays, sounds, and many lagoons. There are thus two distinct habitats for shore-loving fish. The broad continental shelf with its many " banks " brings deep-sea fish that summer near the ocean's bottom near enough to the surface to be caught readily. The nearness of the New England fishermen to the Bay of Fundy, Nova Scotia, the Gulf of St. Lawrence, the Newfoundland Banks, and even Labrador, extended the area of fishing grounds. The fishermen of Maritime Canada, until the last fifty or one hundred years, have never been numerous enough to offer much competition, and in all these fishing grounds New England fishermen have had an advantage over those of Europe because of the shorter distance to the home markets.

The New England fishermen have always had cheap material for the building of their vessels and, most fishermen being adept in the use of ship carpenter's tools, built boats during leisure times. Little capital was needed, therefore, to enter the fishing industry. The vessels were staunchly built, seaworthy, and expertly handled. The nearness of the fishing grounds to the home ports had many advantages. The voyages were short. Small vessels were used. Vessels, in case of a storm, could reach a harbor readily and thus reduce the risk to life and property, and for that reason insurance rates were low. Fishing could be pursued by many as a spare-time occupation, and many fishermen were aided by the women and children in the curing of the fish. Until the invention of net-making machines, the women made many of the nets. Fishing, especially inshore fishing, was somewhat of a family affair.

The Earnings of the Fishermen.—Fishing has never been a very " gainful " occupation. Until the large companies came into existence and success became a matter of expensive equipment, few fortunes were made. The love of the sea, the possible chance of a good season, lack of knowledge of other industries, the " chains of habit," and pure inertia have kept many on the fishing grounds. In the early days, before the dominance of manufactures in the economic life of the people, the traditions of the family and the education of the children were confined chiefly to nautical affairs. By the age of ten many a boy had entered upon his period of apprenticeship. " He aspired to the position

of skipper of a schooner, possibly owner of the craft he was to command, and it was this ambition that led him, summer and winter, to face the storms of the Atlantic in preference to the fields and forests of the Middle West."

When agriculture, lumbering, commerce, and fishing were the leading occupations, the returns from fishing compared favorably with those of the others; but as new and rich agricultural lands opened up in the Middle West, the Great Lakes forests began to be exploited, manufactures developed in the East, and economic life became complex, fishing became one of the less gainful occupations. The high price of fish in late decades has increased the income of the fishermen to some degree; but the catch is declining relatively, because the waters are being exploited. In 1908—the latest date at which a complete fisheries census was taken—there were in the United States 143,881 fishermen. The value of the product was $54,000,000, making an average gross return of less than $390 per worker. With reduction for interest on investments, depreciation, overhead charges, and other items, the returns must have been low indeed. In 1837 the cod fishermen of Massachusetts employed 11,146 men on the fishing vessels, and an equal number on shore to prepare the fish for market. The value of the fish products was only $3,208,000. An investigation, at the direction of Congress, revealed the fact that in the decade between 1840 and 1850 the average cod fisherman of New England received an annual net income from the fisheries of $76.89, and this included the Government bounty of $14.58; and from 1846 to 1851 the mackerel fisherman's income was on the average but $64.04 from the fisheries.

The Value of the Fisheries.[1]—In total value of product and income per man, the fishing industry has not, particularly in the last century, compared favorably with other industries. The product of the fisheries of the United States in 1908 was $54,000,000; that of the minerals, $1,373,000,000; and that of the manufactures (1909), $20,700,000,000. The value of the catch of fish by Massachusetts in 1919 was about $11,000,000, but the output of the factories of that state was $4,000,000,000. New England fisheries in 1919 yielded $19,839,000 worth of products, and those of the Middle Atlantic States in 1920 and 1921 $24,000,000. (Fig. 97.)

The strategic importance of the fisheries in the past and their influence in the development of overseas commerce, however, far transcends their economic value to the nation. Our naval and merchant craft are now little more than mechanical engines on which a boy from the farm, the factory, or the machine shop is as much at home as one sailor-bred.

[1] Data for whole country for any one year not obtainable except for 1908.

Before they assumed this character, however, the fisheries were the nurseries for seamen. Besides being considered the "cornerstone of New England prosperity," the fisheries furnished men for the first navy; and in the Revolutionary War and the War of 1812 most of the privateers were manned by fishermen. Bounties were provided from time to time by local, state, and national governments to encourage the fisheries.

The Cod.—Of the deep-sea fish, the cod, until the Civil War, was by far the most important. For more than two centuries the history of the New England fisheries was little more than the history of cod fishing. To many a New Englander, even to-day, the cod is the best of food fish. Many diplomatic battles have been fought and treaties made with France, Britain, and Canada in the interest of the cod fishermen of New England.

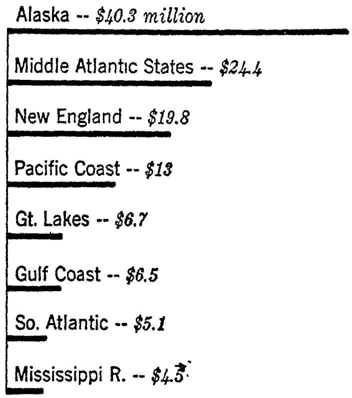


FIG. 97.—Annual Value of Fishery Products by Regions.

The year varies for different regions. Some data are for 1920, some for 1924. All lie between 1920 and 1924 inclusive The Northeastern States hold the leading place in fishing. Much of the catch in eastern United States is sold fresh while the catches of Alaska and the Pacific Coast reach the markets in tin cans. California leads the Pacific Coast States in the canning of fish.

The cod lives for most of the year in salt water that ranges in temperature from 35° to 45°, and on a rocky or stony bottom at a depth of about 120 fathoms. It is sometimes taken at a depth of 250 fathoms, and in the spawning season it moves into shoal waters near the shore.

The stony banks on the continental shelf of the Gulf of Maine, the Grand Banks of Newfoundland, and other smaller banks, and the rocky submerged ledges and islands from Cape Cod northward are the best cod-fishing grounds in the world. The most celebrated fishing grounds in the Gulf of Maine are George's Bank, Middle Bank, Flippenies Bank, Jeffrey's Ledge, Cashe's Ledge, Blatt's Bank, Grand Menan, Gorman's Banks, Seal Island Grounds, and Browns' Bank. The cold Labrador Current keeps the water temperatures low and brings in fresh supplies of food. (Fig. 263.)

Some time during the spawning season, October to April, the cod, both female and male, move into shoal water, and each female extrudes eggs to the number of 2,000,000–5,000,000. After being fertilized by the male, these float to the surface, where the sun hatches them in twelve to twenty-one days, and the small fry begin their struggle for existence. The cod attains a weight of 4–5 pounds in three years and many ulti-

mately weigh 50–70 pounds, although most of the cod caught weigh 15–30 pounds. The cod is a predatory fish, and a voracious eater, devouring any life small enough to swallow. It takes in the smaller shellfish whole, and conchologists find many excellent rare specimens of shells in the stomach of the cod.

The craft used in fishing for the cod vary in size from small sailboats manned by two men who cast their lines near the shore on the lee side of rocky headlands, to sailing schooners or auxiliary schooners operated by a crew of fifteen to thirty men, which resort to the deep-sea banks and are, therefore, called " bankers." The typical " banker " to-day is 120 feet long, has a depth of 10 or 12 feet, and a 25-foot beam. The main mast rises about 85 feet above the deck, with a topmast above this, 45 feet long. It may spread 2000 square yards of canvas. It has a gasoline engine of 75–100 H.P. and is roomy enough to give comfortable quarters to fifteen to thirty men, besides having space for an ice house, general storerooms, and the storage of 300–400 barrels holding the catch. Such a vessel costs $20,000 or more.

For two centuries or more, hand lines were used in catching cod, the fishing being done from the side of the vessel. About 1850–55 the trawl began to be used, and now nearly all the cod fishing is done by trawls, which are set and taken up by dories carried by the schooners. A trawl is a stout line 5000 or more feet long from which at intervals of about 6 feet are hung 3-foot lines to which the hooks are attached, one hook to a line. The trawls when not in use are usually coiled in tubs. When a fishing schooner arrives at the fishing ground, the dories, each with a tub containing one trawl, are sent out to set the trawls, if the weather is favorable. Each dory is manned by two men; one does the rowing, and the other lets out the baited trawl. In former days, small fish were caught on the fishing grounds by small nets, for bait, but in recent decades frozen herring are used, being purchased at the embarking port and kept on ice during the voyage. The first end of the trawl is fastened to a buoy or float, so that it may be found readily. Other devices are used to keep the trawls from resting on the bottom. The trawls are distributed over a large area on the fishing grounds. One dory may set two trawls, but one trawl to the dory is the general rule. The trawls, after being set for five or six hours, are visited or " under run " as the expression is, by the dories, and the fish, if any, are removed and the hooks rebaited, or the trawl coiled in the tub if it is to be taken in. On the return to the mother vessel, the fish are cleaned. The liver (for cod-liver oil), the air bladder (for isinglass), and the bones are removed and saved, the internal organs are cast overboard, and the flesh thrown into tubs of salt water, thoroughly washed, and then salted and pickled.

This is the work day after day, from early morning to sundown, for three or four months, if the trip is to the Grand Banks. The vessels that bring fresh cod to market, of course, make much shorter voyages, a matter of only a few days.

Winter fishing is laborious and accompanied with many hardships. Hauling in a mile or more of wet trawl, from water near the freezing point, on a winter day in a chilling wind and heavy sea, is an occupation most people shun. Besides, the fishermen are subject to many dangers. Most of the time, when the catch is on, the dories are a mile or more, and even several miles, from the schooner on the open sea. Strong winds and the high seas may make it difficult to reach the mother ship. A dense fog may set in, and the dory may become lost at sea with limited amounts of water and provisions. Then may come days and nights of constant rowing to reach land or the "lanes" of the ocean frequented by trans-ocean liners. The trawler operates both summer and winter, but winter fishing is more disagreeable.

Comparative statistics showing the trend of the cod fisheries are difficult to obtain. In recent decades there has been a decline, due probably to our over-fishing of the waters, in spite of the admirable work the fish hatcheries are doing to maintain an adequate supply. During the year 1920, nearly 500,000,000 cod fry were planted off the New England coast, along with 1,600,000,000 flounders, 558,000,000 pollock, 150,000,000 haddock, and many millions of others.

Cod fish may be purchased on the markets as fresh cod, dried cod, "fish flakes" in cans, pickled cod, or salted boneless cod in the shape of bricks. Only about 60 per cent of the "cod-fish" bricks are cod fish, for hake and haddock are often sold under the name of cod.

Mackerel Fishing.—Until about 1750, mackerel was used chiefly for bait; then the exporters began to send this fish, which they considered very inferior, to the West Indies to feed the slaves on the sugar plantations. The West Indies had long been taking the inferior grades of fish. In 1763 there were about ninety mackerel vessels in operation, the catch being valued at $80,000. From 1804 to 1818 the total number of barrels inspected at New England ports was less than 240,000. After about 1820 the industry advanced rapidly. The greatest period of prosperity was during the Civil War; in some years the catch was more than 300,000 barrels and was valued at $6,000,000. In 1884 the returns were 478,000 barrels, but in 1886 there were only 80,000, and since that time no year has seen as many as 100,000 barrels and some years only 10,000–15,000. The returns fluctuate greatly. One year the catch may be 25,000 barrels (1895); the next year, 77,000; and the third year it may drop back to 13,000. Such uncertainty is extremely discouraging

to mackerel fishermen; yet, with full equipment on hand and the possible chance of a very prosperous year, they hang on. Some years, some vessels on a trip of several weeks may not catch sight of a single school of mackerel.

The mackerel is the "mystery fish" of the deep-sea fisheries. It is a warm-water fish and migrates northward with the northward movement of the sun. It reaches Cape Hatteras about April 1, and the New England coast early in June. Another body reaches the shores of Nova Scotia about July 1. With the coming of the winter it starts southward. Its destination is unknown to man. It is a surface-swimming fish, sometimes moving in vast schools that spread over several square miles, and again at times traveling in small detached groups. A small school may yield only a few barrels, while from a large one several hundred barrels may be taken. A mackerel schooner is in most respects like the cod-fishing schooner. At the mast is a lookout station from which the lookout may scan the surface of the ocean 5 to 10 miles in every direction. The special equipment consists of one or more purse seines, a seine boat or two for casting the seines, one or two smaller boats or dories to assist the seine boat, some 300–400 barrels to hold the catch, until the market port is reached. A captain, a cook, and fifteen or sixteen men form the usual complement of the crew.

The best fishing comes just before sunrise and sunset, hence preparations must be made for the morning's trials before daybreak, and if a haul is made near sunset the men work on into the night. When a school is sighted by the lookout, the men take their places in the seine boat and the dory, ready to put off. Meanwhile the lookout and the captain study the school to determine exactly its movement. When this is fully ascertained the seine boat puts off with the captain of the schooner in command, for now comes the most critical part of the work of the mackerel fishermen. The seine boat is, as a rule, 35–40 feet long and 7–8 feet wide and is propelled by oars. The work of the men in the seine boat is to cast the seine, as the boat is being rowed rapidly in a circle about the school. In the meantime the dory has put out from the schooner and has picked up the first end of the seine, and particularly the first end of the bottom line of the seine, called the purse line. The purse seine is a large net, with a $2\frac{1}{4}$-inch mesh, about half a mile or more long and 200 feet wide. Along the top is a row of corks large enough to keep the top part of the seine from sinking as the seine hangs vertically in the water. When the seine boat has completed the circuit and has reached the dory, the purse line is drawn and thus closes the seine below the fish, much as a puckering string closes a bag. The fish are thus caught in a huge seine bag. Slowly the bag is gathered in to bring the

fish together. When the schooner reaches the seine boat and dory, the mackerel are baled out of the seine by large dip nets, and emptied on the deck of the schooner. Then begins the process of packing the mackerel. If they are to be delivered fresh they are packed in chipped ice in barrels. If they are to be salted they are dressed, carefully soaked in water, and packed in salt and later covered with brine.

The taking of a school of mackerel means quick work and no rest until the last fish has been prepared. A large haul may employ the men all day from early dawn, and if another is made at sundown the work must go on during most of the night. The work of the mackerel fisherman is not so disagreeable nor quite so dangerous as that of the cod fisherman on the banks, for the former operates in the summer months and the fogs are not as frequent, but the work is quite as strenuous.

Herring Fisheries.—The herring family, of which the leading varieties are the true or common herring, shad, alewife, and menhaden, is the most important of the commercial fish of the world. The common herring has been for centuries the food of rich and poor alike on the coast lands of the cooler parts of both the Atlantic and the Pacific. It is sold as frozen herring, fresh, pickled, dried, or smoked. The herring is caught in deep water off the coasts of Newfoundland, eastern Canada, and New England, and on the Banks; but more often within the 3-mile limit in bays and inlets, where it resorts to spawn. Here it is caught as it moves near the surface of the waters in great schools. The young are taken on the Maine coast and canned in oil and sold as sardines.

The Less Important Fisheries.—Shad and alewife are caught in great numbers in nearly every inlet, bay, and river mouth from Florida to Maine, inclusive. They are anadromous, ascending the coast rivers to spawn, traveling hundreds of miles, in some cases, from the ocean where not checked by dams. They have about abandoned some rivers because of water-power dams, chemicals discharged by industrial plants, sewage of cities, and muddy water from newly opened ditches. The rivers of Maine, Connecticut, Pennsylvania, and New Jersey furnish most of the catch from the Northeastern States. Many of the New England rivers have been stocked with shad fry. Through the activity of the many state fish hatcheries of some of these states, working in conjunction with the United States hatcheries, attempts are being made to prevent the extermination of this fish. The alewife is considered superior to the sea herring as food, but not so good as shad. Like the shad, it is caught in large quantities in the lower courses of the rivers by means of pound nets, wires, gill nets, and seines.

The menhaden is little used for food but is valued commercially for its oil and as a fertilizer, and as bait for cod and other ground fish

caught by the hand line or trawl. Thousands of barrels are used by the cod fishermen in a single season for bait. The fish is taken by means of the purse seine, as it swims in schools numbering thousands of individuals, "swimming in closely packed, unwieldy masses, helpless as flocks of sheep. . . ." The extracting of menhaden oil was begun about 1850 on the coast of Maine. For many years, fisher-farmers operated hand presses, three or four families often forming a neighborhood company. The first factory was built in Maine in 1864. Now there are factories to be found in many coast towns from Maine to Florida, and in recent decades there has been a tendency for the industry to shift to the states south of New England.

Lobster Fisheries.—The lobster is an inshore fish whose habitat is clear water on rocky bottoms, mainly from Cape Cod Bay northward. It lives at various depths. In the spring the mature lobsters migrate into shallow waters where they spawn, and here they remain most of the summer, returning in the fall to the deep water, 100 fathoms or more. The eggs remain attached to the female for about ten months before hatching, the larvæ then floating to the top of the water, where they remain until about half an inch or more long, and then descend to the bottom to seek shelter on a rocky ledge. The lobster was caught in Colonial days for food, but not until the middle of the last century was it an article of commerce. The canning of lobster began about 1840–50. In 1880, when the price of lobster was only 1.8 cents per pound, there were 2819 fishermen egaged in the industry. In 1913, when the price went to 19.8 cents, 4500 persons were employed in lobster fishing and the catch was valued at $2,349,000.

The lobster is taken by means of pots or traps made of lath, in the form of a barrel, the laths, separated by spaces large enough to permit the free passage of water, serving as staves. At the ends of the traps are funnel-shaped strips of steel or copper netting, pointing inward, with a hole at the apex large enough to permit the passage of a lobster. The pot is sunk by means of stones or weights placed on the inside, and is marked by a buoy. The lobsters are enticed into the pot by bait, which is suspended inside the trap near the middle. When they are once inside, the way out is difficult to find. The fishermen visit the pots once or twice a day to remove the lobsters, if any, and rebait the pots if necessary. The lobsters, if not marketed soon after being taken from the pot, are kept in floating boxes made of lath, called lobster cans.

Oysters.—The sandy coasts of New Jersey, Long Island, Connecticut, Rhode Island, and Cape Cod provide annually about $10,000,000 to $12,000,000 worth of oysters, although the industry belongs more to Delaware and Chesapeake Bays than to these sections. In New

England the industry is of recent development. In 1880 only $655,000 worth of oysters were produced; more than half came from Connecticut. In 1905 the output of New England was nearly $4,000,000 and has steadily increased since, and to-day the oyster catch of New England exceeds in value the combined output of the cod, mackerel, and common-herring fisheries.

QUESTIONS, EXERCISES, AND PROBLEMS

1. A successful fisherman is he who knows best the habits of fish. What practical biological knowledge is essential to the cod fisherman? To the mackerel fisherman? Does oyster fishing furnish as much intellectual stimulus as cod fishing? Will it develop as good seamen?

2. How have geologic forces and processes prepared the coastal districts and waters of New England and eastern Canada for the fisherman?

3. What advantages does the Chesapeake Bay region possess over the Maine coast for the oyster industry.

CHAPTER VIII

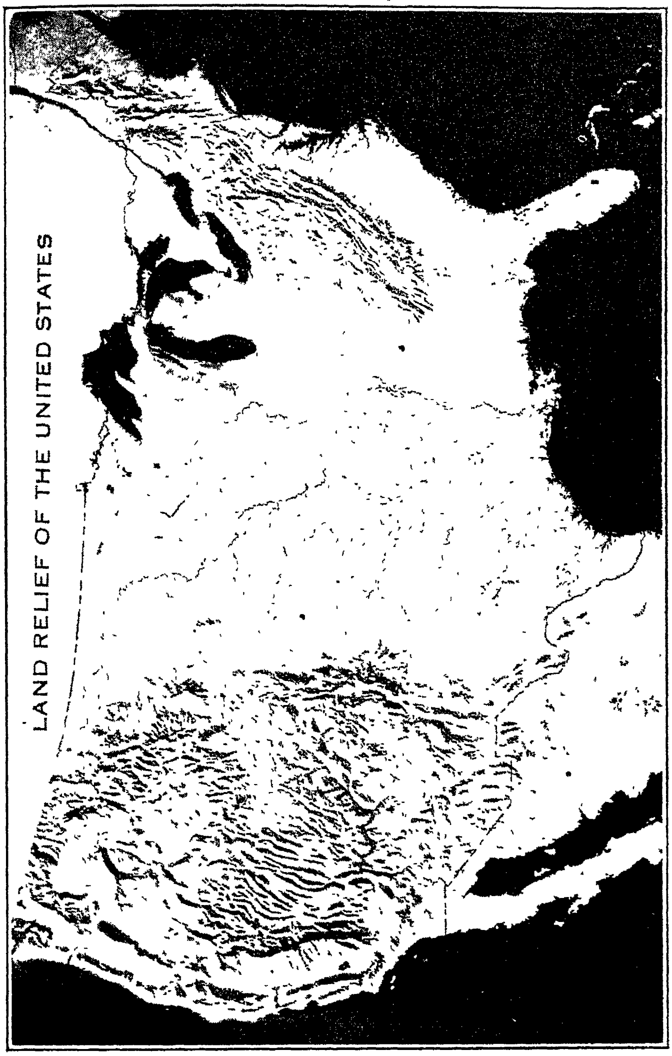
THE NORTH CENTRAL SECTION—AN INLAND EMPIRE [1]

A Great Plains Region.—Plains have always been important in the economy of man, and humid, temperate ones particularly so. Such plains have been the great producing areas for most of the world's people, as they possessed a stimulating climate, and provided an abundance of well-watered, adequately heated, fertile lands; their low relief favored easy communication with all parts; many possessed rich deposits of the most useful minerals, and were accessible to the ocean. The north central portion of the United States is part of the vast Great Central Plain which extends from the Gulf of Mexico to the Arctic and from the western to the eastern highlands. Fully 1,250,000 square miles of this great inland plain is capable of high development. The north central humid section of this plain in the United States, here being considered, is nearly as large as the combined area of the British Isles, France, Germany, Belgium, Netherlands, Denmark, Switzerland, Austria, and Czechoslovakia. It now maintains only about 18 per cent as many people as there are in the countries named, though it rivals them in the natural assets within it, or tributary to it and unrestricted by artificial barriers such as political boundaries. The whole section is of low relief, with only minor elevations here and there which offer no serious obstruction to intercourse throughout its extent. The low relief, navigable rivers and Great Lakes, and low passes through the eastern highland by way of the St. Lawrence and Oneida–Mohawk depressions, permit access to the Atlantic—the world's chief commercial ocean. Similar low relief and navigable rivers provide equally easy access to gateways at the south on the Gulf of Mexico. These eastern and southern gateways are of special significance, since the eastern United States and Europe are the principal outside markets for the agricultural and other products of the central plains.

A Propitious Climate.—The climate is of even greater significance than the surface, soil, and gateways. It is of the continental type, with

[1] This section has been written so as to provide abundant material for problem-solving, but the selection of a problem or problems has been left to instructor and student. See p. ix and Chapter XXI.

hot summers and cold winters but with precipitation sufficient for agricultural purposes. (Fig. 5.) Weather changes are frequent, due to the passage of cyclonic areas, and provide frequent showers. The



Courtesy U. S. Department of Agriculture.

FIG. 98.

Between the lofty mountain and plateau area in the West, and the comparatively low Appalachian highland in the East, lies a broad expanse of level to gently rolling plain, except where broken by the Ozark uplift

rainfall decreases westward from 40 inches in eastern Ohio to 20 inches at the 100th meridian, but increases in the proportion that falls during the spring and early summer months, thus extending the productive area far westward. The growing season varies from 190 days in the south to

100 days in the north, favoring the growth of a great variety of agricultural products.[2] (Figs. 9–12 and 100–103.)

A Land With Copious Resources.—The North Central Section offers greater opportunities as a home for man than any other similar region of the United States. Here are agricultural and grazing lands of the richest; here is power—coal, oil, natural gas, water; here are iron, copper, lead, zinc, cement-making materials, forests; here is a healthful, stimulating climate; here are the Great Lakes and America's great rivers; here is nearly a third of the population of the United States—a progres-

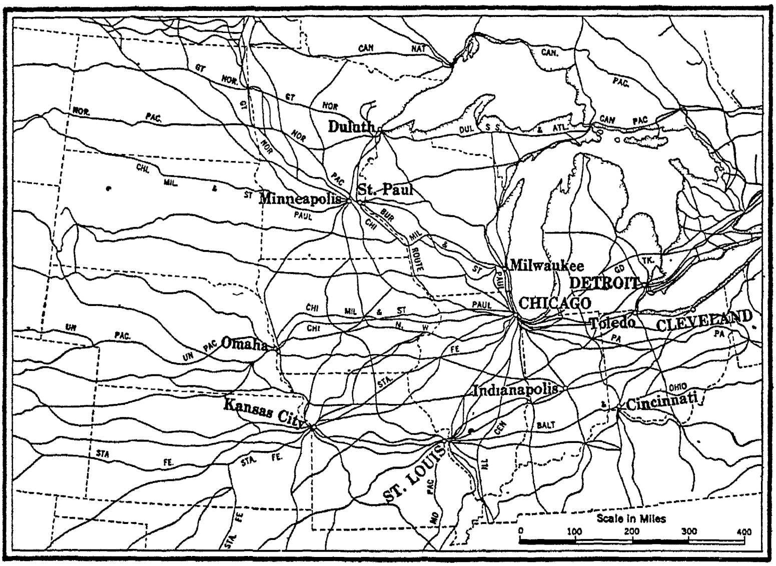
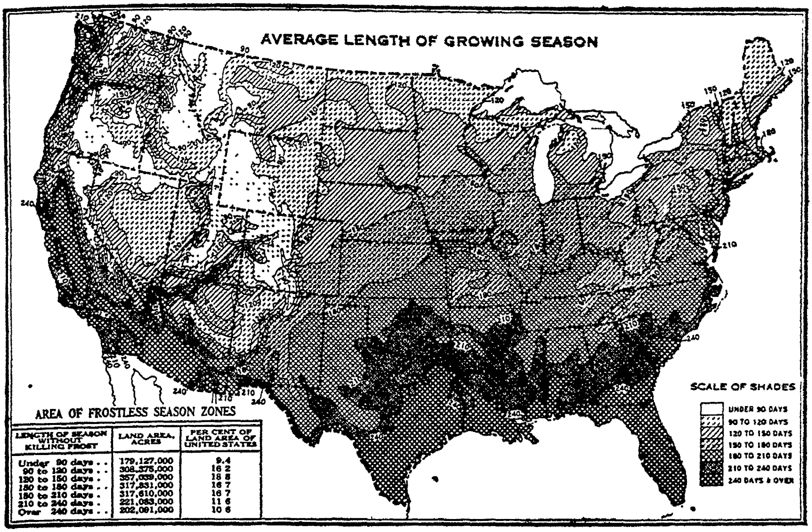


FIG. 99.—Principal Railroads in the North Central States.

The railroad mileage in this group of states is more than two-fifths as large as that of Europe, and constitutes 38 per cent of the total in the United States.

sive, capable people maintaining a stable government; here is one of the world's most richly endowed areas—the making of a great Inland Empire. Though a casual examination will reveal somewhat divergent physiographic, climatic, agricultural, and other industrial units, such as the Corn Belt, Spring-wheat Area, etc., yet all are so closely related, so integrated, that common interests are being clearly recognized for the whole area and the evolution of sectional consciousness is in progress.

[2] For further discussion of climate, see Chapter II.

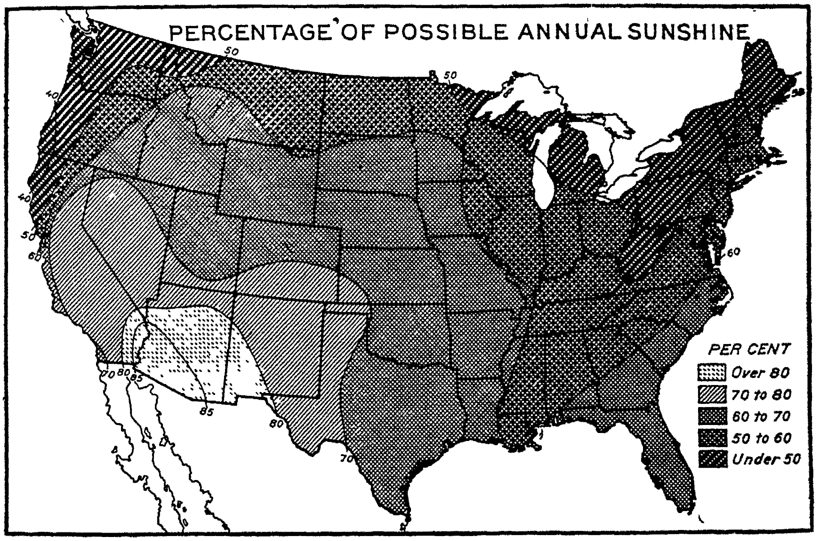


LENGTH OF SEASON WITHOUT KILLING FROST	LAND AREA, ACRES	PER CENT OF LAND AREA OF UNITED STATES
Under 90 days . .	179,127,000	9.4
90 to 120 days . .	308,375,000	16.2
120 to 150 days .	357,039,000	18.8
150 to 180 days . .	317,831,000	16.7
180 to 210 days .	317,610,000	16.7
210 to 240 days .	221,083,000	11.6
Over 240 days . .	202,091,000	10.6

Generalized map from Atlas of American Agriculture, U. S. Department of Agriculture.

FIG. 100.

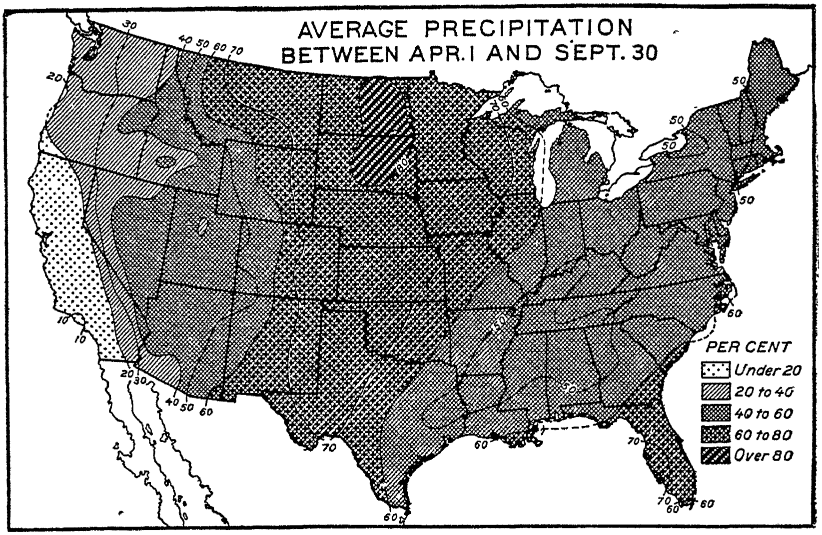
More than 90 per cent of the United States has a growing season longer than 90 days. The season ranges from an all-year tropical condition in southern Florida to less than 90 days in the western highlands where high altitude and aridity favor rapid radiation at night. The powerful influence of the mild westerly winds from the Pacific carry a growing season of more than 200 days northward along the coast through Washington, and the lesser influences of cyclonic winds from the Atlantic extend a similar growing season northward to Chesapeake Bay.



Courtesy U. S. Department of Agriculture.

FIG. 101.

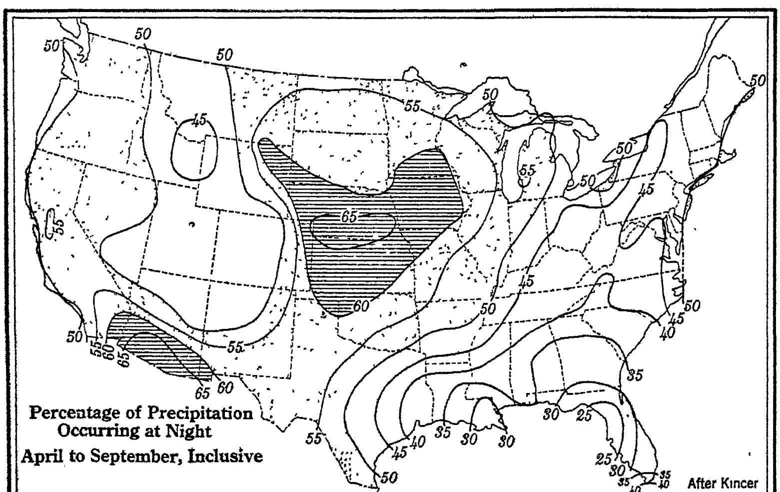
The principal agricultural regions of the United States receive from 50 to 70 per cent of the possible amount of sunshine. (See Fig. 16 for Agricultural Regions.)



Courtesy U. S. Department of Agriculture.

FIG. 102.

Where the total annual rainfall is small its seasonal distribution is of great importance. Throughout most of the Great Plains Region from 70 to more than 80 per cent occurs during the warmer half of the year when it is of greatest benefit to crops During the same period from 50 to more than 70 per cent occurs throughout the eastern agricultural region. Compare with Figs. 9–12.



After Kincer, Atlas of American Agriculture.

FIG. 103.

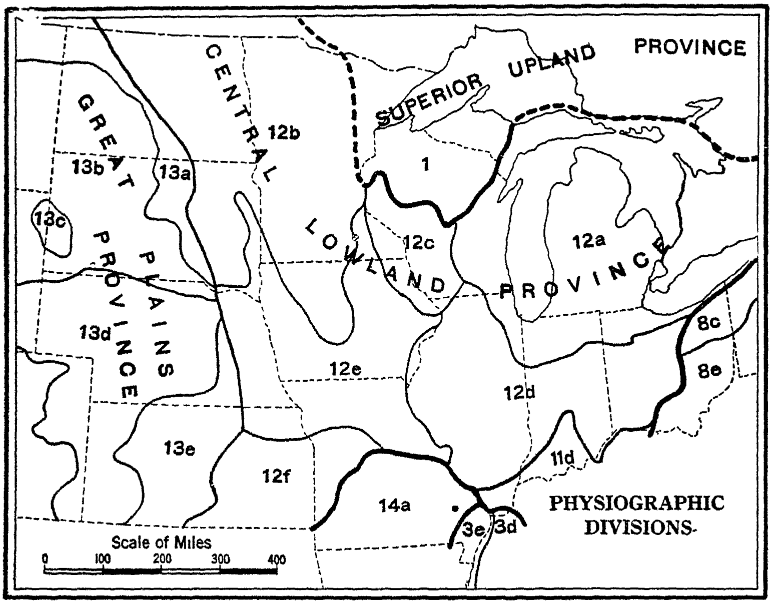
Ideally we would have rainfall occur in frequent, gentle showers at night during the growing season, and have abundant sunshine during the daylight period. It is significant that 40 to more than 65 per cent of the total warm season precipitation occurs at night over our principal agricultural regions. Compare with Figs. 9–12, 100–102, and formulate a statement of the significance of the relations shown.

PHYSIOGRAPHIC REGIONS

Major Regions.—Though the North Central Section is essentially a plain of low relief, the great variety of soils, the character of the old and new glaciated surfaces and the unglaciated areas, rocks of varying geological age, and small variations in relief produce divergencies sufficient to warrant the consideration in this discussion of at least two major physiographic regions—the Lake Region and the Central Low Plains. These regions may in turn be further subdivided when limited areas and greater details are considered. The boundaries, however, are zonal rather than lineal in most places. The regions of human use are not delimited by the physiographic boundaries, and the process of man's adjustment to what—at least theoretically—will be the most appropriate boundaries for selected types of activities is still in progress. Conceivably, the time may come when man will find the activity that can best be carried on in each unit. However, such an ideal adaptation is far in the future and will not be determined by physiographic features alone, nor are they likely to be the most important determinants. (Fig. 104.)

The Lake Region.—No marked topographic feature separates the Lake Region from adjoining lands, yet it is readily recognized as a physiographic unit. Its distinctive surface features are due to recent glaciation and are characterized by moraines, lacustrine plains, swamps, and thousands of lakes. It was originally forested, and a large portion of the north is still occupied by native forests or cut-over lands, while most of the south has been cleared for agricultural purposes. A southern extension of the Canadian Shield, a forested and slightly rugged mass of ancient rocks, projects into northeastern Minnesota, northern Wisconsin, and the Upper Peninsula of Michigan. These rock masses were somewhat subdued by glacial erosion and nowhere take on the character of mountains. The chief resources of the Upper Lake Region are its forests, iron ore, and copper, which have been exploited extensively by man. Agriculture on the cleared lands is slowly extending into the northern region but is dependent upon the lumbering and mining communities for a market. Agriculturally, most of the Lake Region lies in the Hay and Dairying Region, but the Corn Belt extends into the southern portion. The southern portion also has most of the population and many large cities, and is one of the most important manufacturing and commercial sections of the United States. Much of the region's importance is due to the Great Lakes as well as to the great resources of minerals, forests, and soils, as few other areas of the world possess such superior opportunities for inland transportation. In the early days the Great Lakes carried

the explorer, fur trader, and settler in canoe or sailing craft; to-day steel vessels that rival the largest ocean freighters in size annually carry a freight tonnage nearly seven-tenths as great as the combined tonnage of all Atlantic, Gulf, and Pacific ports of the United States. The principal products carried are iron ore, coal, grain, and lumber. Many commercial and industrial cities such as Chicago, Detroit, Cleveland,



After Fennemen, Annals Assoc. Am. Geog., Vol. VI.

FIG. 104.—Physiographic Provinces and Sections of the North Central States.

The sections are named as follows:

3d. East Gulf Coastal Plain.
3e. Mississippi Alluvial Plain.
8c. Allegheny Plateau (glaciated).
8e. Allegheny Plateau (Conemaugh).
11d. Western (unnamed, but part of Interior Low Plateaus).
12a. Eastern Lake.
12b. Western Lake.
12c. Wisconsin Driftless.
12d. Till Plains
12e. Dissected Till Plains.
12f Osage Plains.
13a Missouri Plateau (glaciated).
13b. Missouri Plateau (unglaciated).
13c. Black Hills.
13d. High Plains.
13e. Plains Border.
14a. Springfield–Salem plateaus.

Buffalo, Toledo, Milwaukee and Duluth have grown up along the Lake shores.

The Central Low Plains.—This region of low plains extends south and west from the Lake Region and, as Dr. Fenneman has aptly stated, " is in the main bounded by lands which are either not low plains or not

plains."[3] To the south and east are the Ozark Plateau and the western plateaus of the Appalachian System. On the west the boundary is more indistinct, especially in Kansas and Nebraska. Along the western boundary the glacial drift is thin, and loess is distributed over both glaciated and unglaciated lands. To the west are the high semi-arid grazing lands of the Great Plains (or plateau), and to the east the more humid, fertile prairies adapted to agriculture. As the name implies, the surface of the region, as a whole, is a gently undulating plain, though in a flat country low hills may become quite conspicuous features locally. With the exception of limited areas such as the Driftless Area, essentially all the surface is covered by glacial drift older than that of the Lake Region. Upland lakes and swamps are rare, the morainic hills or ridges are comparatively low, and the slopes are gentle. Though the region as a unit possesses great uniformity, yet the differences between glaciated and unglaciated areas, between recent and old glaciation, and between the work accomplished by altering agencies that toiled upon these surfaces through the thousands of years since glacial times afford a considerable variety of soils. These contrasts in relief and soil, together with native vegetation, afford bases for subdividing the region into, at least, the Forested Glacial Plains of Ohio, Indiana, and southern Illinois, which were originally timbered, and where the glacial surface is dissected into hills only along the streams; the Prairie Plains, a vast native grassland country extending westward to the high Great Plains; and the Driftless Area of southwestern Wisconsin and adjoining states, with its poor, light soils derived from the underlying sandstone, and fertile clay loam soils derived from limestone.

The Driftless Area.—An area of about 15,000 square miles in southwestern Wisconsin, and extending into adjoining states, was not covered by ice at any time during the glacial period. It is essentially a dissected plateau similar in many respects to western Kentucky. Along its morainal contact with the Lake Region, glacial outwash material fills many of the valleys, forming extensive plains above which rise numerous native rock hills resembling the buttes so common in the West. Numerous picturesque cliffs, crags, pinnacles, and curiously formed "needles" and "chimney rocks," formed by caps of limestone on the easily eroded sandstone, are common and striking features. There are also many sink holes and caves. Weathering has produced a mantel of residual soil varying from sand, to sandy loam derived from sandstone, to clay-loam derived from the limestone. The sandstone-derived soils are poor, and the average value of farm land is about 20 per cent less than in the

[3] Physiographic Boundaries within the United States, Annals Assoc. of Am. Geog., Vol. 4, p. 109.

adjacent glaciated sandstone area. Land values in the glaciated limestone area of Wisconsin are about twice those of the glaciated sandstone and two and a half times those of the unglaciated sandstone,[4] while the unglaciated limestones of the southwest have been so efficiently utilized for pasture, hay and forage, and dairying that land values are less than a tenth below those of the glaciated limestones. The uplands of the Driftless Area in Minnesota carry a heavy cover of fertile loess and are highly productive.

COHERENCE IN THE SECTION

The differences in soil and relief are not nearly so important in the major use that man has made of the section's resources as might be inferred from the contrasts drawn. The " human-use regions " overlap and cross the physiographic regions indiscriminately. Far more important is climate. This is well shown in the present distribution of agricultural regions. Most of the Corn Belt, much of the Corn and Winter-wheat Belt, and essentially all of the Spring-wheat Area, lie within the Central Low Plains, and their limits are not determined by physiographic features. None of the major regions or subdivisions are separated by marked features. Neither are they independent economic units. Instead they are distinctly interdependent, each having a variety of interests but specializing in one or more. The leading product of one unit may find its chief market in another, or entirely outside the North Central Section. For its successful development, each region depends quite as much upon the outside, as a market for its products and a source of goods not produced by it, as upon its own resources. In many cases a region produces only raw material that finds its market elsewhere, e.g., the Spring-wheat Region and the Lake Superior iron region (Upper Lake Region).

Together, the divisions of the North Central Section produce the essentials for sound economic development and a surplus to exchange for commodities produced elsewhere. With coal, water, petroleum, and natural gas as power, much of the raw material is converted into finished products. Within the region, many manufacturing, mining, and commercial centers are developing. With this development is growing a more insistent political demand for cheaper outlets to the sea, such as the proposed Great Lakes–St. Lawrence, Lakes to Gulf, and enlarged New York Barge Canal projects. The influence of the inland location is now being felt through the competition of the Panama Canal, which favors the eastern and western coasts, and through increased

[4] R. H. Whitbeck, Geography and Industries of Wisconsin (1913), p. 38.

freight rates on railways. It is said that an Illinois trunk manufacturer must pay $5.00 to send a trunk to California by rail, while the eastern producer ships a similar article by way of the Panama route for $1.25; that the rates on an automobile axle shaft are 23 cents and 9 cents, respectively, over similar routes; and that some goods may actually be shipped to Atlantic ports and thence to San Francisco at a saving of $2.10 per hundred weight over the direct all-rail route. Taking the cost of carrying a ton of goods as a unit of measure, "Chicago, which was 2610 cents away from the Pacific Coast before the War, is to-day 2946 cents away. In other words, Chicago has moved 336 cents away from the Pacific Coast, while New York has moved 224 cents closer. A similar calculation will show that in the same period, since ocean rates have remained about the same, Chicago has moved 594 cents away from the Atlantic seaboard and South America."[5]

INDUSTRIAL DEVELOPMENT

Relative Position of North Central Section.—In addition to its leading position in agriculture, the North Central Section is one of the most important manufacturing, commercial, and mining regions of the United States. It possesses a remarkable combination of geographic and economic factors favorable to industrial development. Its great extent of well-drained and fertile lands of low relief produces huge quantities of agricultural raw materials. It has a healthful, stimulating climate; a great variety of metallic and non-metallic mineral resources—coal, iron, copper, lead, zinc, petroleum, natural gas, cement materials, building stone, salt, gypsum, clay; considerable water power; superior transportation facilities on the Great Lakes, thousands of miles of navigable rivers,[6] a close network of railways, and thousands of miles of highways that are being improved rapidly. The section produces more than a third of the total product-value of manufactures of the country and uses nearly a third of the power employed in manufacturing; it produces a fifth of the value of all mineral products, more than four-fifths of the iron ore, a tenth of the copper, about a third of the lead and zinc, more than half the salt, more than two-fifths of the clay products and pig iron, and a third of the steel. Utilization of its varied mineral resources and farm products has resulted in a rapid and extensive development of manufacturing and commerce, and the growth of many industrial centers, especially along the shores of the Great Lakes, or at focus points on

[5] Senate Doc. 183, 69th Congress, 2nd Session, p. 2.

[6] Little used at present, but of high potential value.

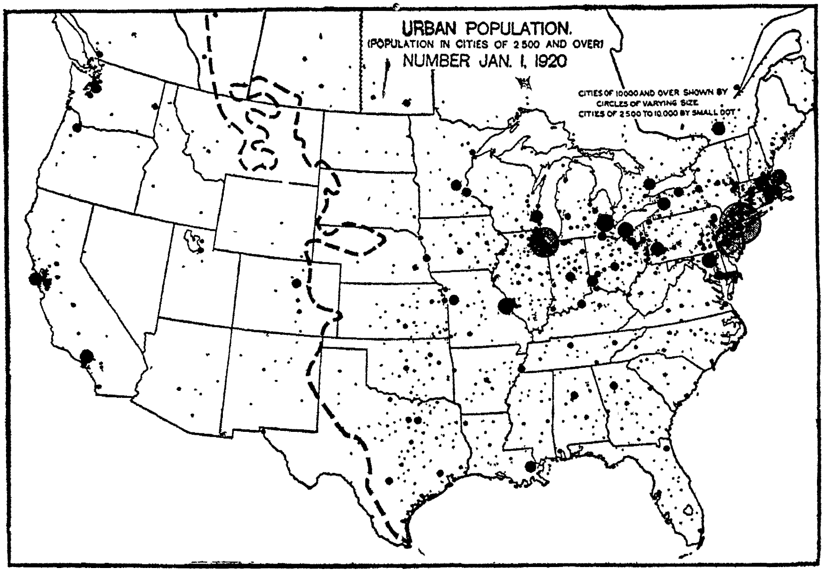
PROBLEMS

1. Can the North Central States maintain a population as large as that now maintained on any equal contiguous area in Europe?
2. Can the North Central States ever equal the North Atlantic States in material development?
3. Will manufacturing become of greater importance than agriculture in the North Central States?
4. To what extent do physiographic regions influence man's activities?
5. Can the handicap imposed by an inland location be overcome?

CHAPTER IX

AGRICULTURE IN THE NORTH CENTRAL SECTION

Agriculture the Leading Industry.—Agriculture is the leading industry, though more people are engaged in the numerous other industries and professions carried on in the region. More than half (52.3 per cent) of the population at the last census was classed as urban, and nearly two-fifths of the cities of the United States of 50,000 or more were in this



Courtesy O. E. Baker and Economic Geography

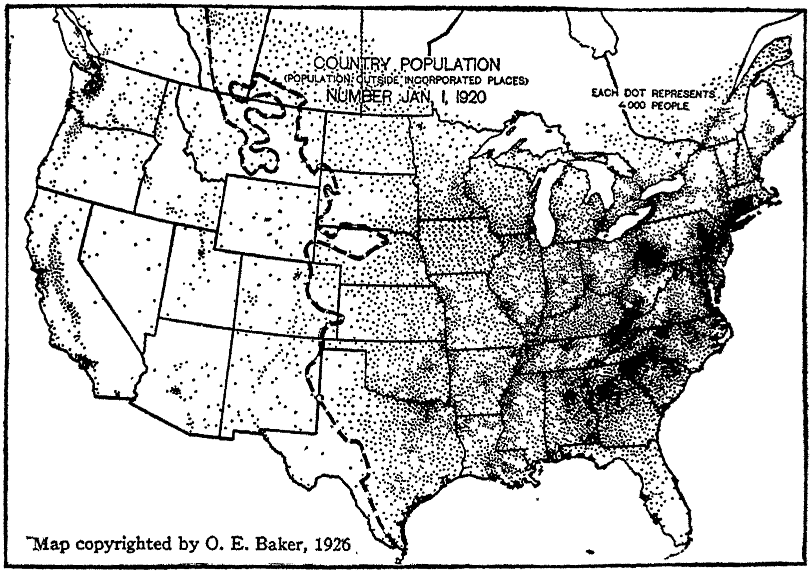
FIG. 105.

Three-fourths of the urban population of the United States is in the northeastern quarter, and about one-third is in the North Central Section. The center of urban population is near Pique, Ohio, and the center of industry of the United States is fifty miles southeast of Chicago.

section. The rural population declined from 61.4 per cent in 1900 to 47.7 per cent in 1920, and this decline is, undoubtedly, continuing. From the standpoint of the farmer, the decrease is economically desirable as it increases his market in the centers where manufacturing,

commerce, and mining are developing, and tends to reduce the total crop production and increase the return per unit. With large farms and the use of machinery, to which the surface of the region is excellently adapted, he will be able to produce sufficient food to meet all demands for considerable time to come. (Figs. 105, 106.)

Agriculture is now more fully developed in the North Central Section than in any other portion of the country. The broad expanse of arable land is well tilled, there are extensive improvements, and the average returns are relatively high. Nearly four-fifths of the entire land area of the North Central humid section is in farms, nearly three-fifths is



Courtesy O. E. Baker and Economic Geography.

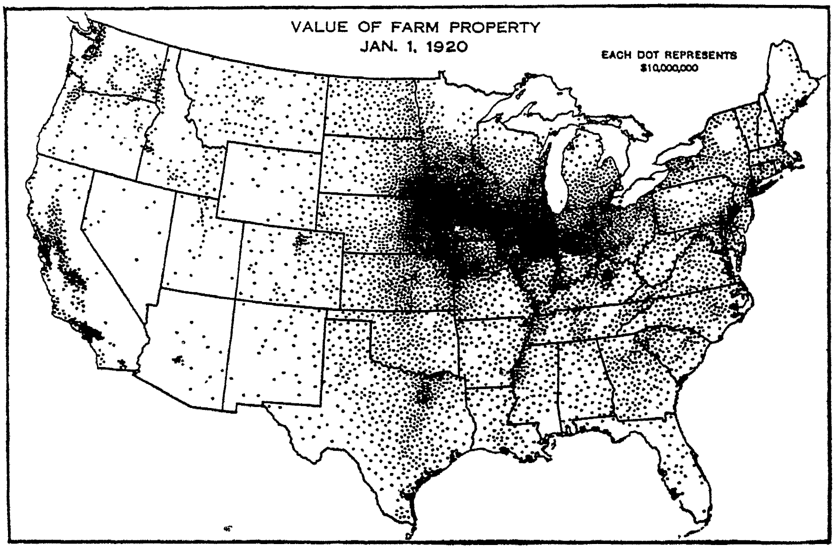
FIG. 106.

The Cotton and Winter Wheat Belts have the densest country population and the Grazing and Irrigated Crops Region the sparsest.

improved farm land; and three-fourths of the land in farms is improved. A large part of the present unimproved land is capable of producing crops or pasture and now constitutes a reserve. The section also has more than half the total value of farm property, farm buildings, and farm machinery; about three-fifths of the tractors, automobiles, trucks, and telephones on farms, in the United States. It produces more than two-thirds of the corn, half the hay and forage, more than two-fifths of the live stock, two-fifths of the value of all crops, three-fifths of all cereals, three-fifths of the wheat, and a similar ratio of other grains.

Nearly two-fifths of its farms are operated by owners. The quarter section has become approximately the standard size farm, as the average is 149 acres. Table VIII illustrates the relative agricultural importance of the North Central humid section. It is preëminently America's food-producing region.

Premier geographic conditions have made possible this rapid and extensive agricultural development, such as the great expanse of level land suited to large-scale use of labor-saving machinery, manifold variety of soils of high average fertility, abundant summer rains falling in frequent gentle showers, high summer temperatures and long growing season, a stimulating and healthful climate in which to live, excellent home



Agricultural Year Book, 1921.

Fig. 107.

The distribution of farm property value shows a striking relation to the Corn Belt. Within it is located more than a third of the value of farm property and nearly two-fifths of the value of farm land. Only in California do the values of farm property per square mile and of farm land per acre ($114) approximate those of the Corn Belt ($148).

markets in the rapidly growing urban centers, access to eastern and to foreign markets, and superior transportation and marketing facilities.

Leading Crops.—A great variety of crops are now produced, but the fertile soils, large expanse of level land, labor supply, and available markets favor extensive rather than intensive agriculture. The temperature and rainfall are highly favorable to wheat throughout the entire section, and to corn in the central and southern parts. Though the section is dominantly a cereal country, mixed farming combined with live

stock and dairying is becoming established. The wheat areas in such states as Michigan, Illinois, Wisconsin, and Minnesota have decreased, and mixed farming and dairying have come in. The leading crops of the section are corn, wheat, hay and forage, and oats. Other important crops include rye, barley, potatoes, flax, fruits, sugar beets, etc. As shown in Table VIII, a large share of the leading crops of the United States is produced in this section.

TABLE VIII

North Central Section Exclusive of Semi-arid High Plains and Ozarks

1. 78.7 per cent of total land area is in farms
2. 74.5 per cent of land in farms is improved
3. 58.7 per cent of total area is improved farm land
4. 149.2 acres average size of farm
5. 56.1 per cent of total value of farm property in United States
6. 51.1 per cent of total value of farm buildings in United States
7. 52.6 per cent of total value of farm machinery in United States
8. 39.5 per cent of farms operated by owners in United States
9. 57.0 per cent of all automobiles and trucks on farms in United States
10. 63.3 per cent of all tractors on farms in United States
11. 57.6 per cent of all telephones on farms in United States
12. 42.7 per cent of total value of all crops
13. 62.8 per cent of total value of all cereals produced in United States
14. 62.3 per cent of all wheat (bu.) produced in United States
15. 67.3 per cent of all corn (bu.) produced in United States
16. 51.0 per cent of all hay and forage (tons) produced in United States
17. 45.8 per cent of total value of all live stock on farms in United States
18. 52.3 per cent of population is urban
19. 31.8 per cent of total population of United States

WHEAT

Wheat the Principal Food Crop.—There are two major wheat regions, spring wheat at the north and winter wheat farther south. Between these two great wheat-producing areas and overlapping into each, is the Corn Belt. Out of some 945.4 million bushels of wheat produced in the United States in the last census year, 590 million came from this section. It has been estimated that 3000–4000 million bushels of wheat are required annually to feed the wheat-eating population of the world. On this basis the North Central States produce 15–20 per cent of the world's requirements, making this section one of the world's great producers of high-quality foods.

Spring-wheat Region.—The Red River Valley, celebrated for its high-quality wheat, is the heart of the spring-wheat region. Throughout this region, extending westward from central Minnesota into North

Dakota and northward into Canada, the traveler is confronted by mile upon mile of almost level plains carrying a fertile, heavy, black clay-loam soil. Highways, straight as an arrow for many miles, lead off toward the horizon and apparently fade out to infinity. Here and there a group of trees, forming a windbreak about a farm home, or a ribbon of foliage along a stream break the view. During the harvest season of the late summer, thousands of acres of golden-colored grain, falling before the battery of modern harvesting machines, confront the eye. Later, scores of " thrashing rigs " may be seen dotting the landscape, with their stream of broken straw pouring forth from the blower (stacker) appearing not unlike smoke when viewed from a distance. Still later, the night sky is lighted by dozens of burning straw piles that send up their flames like beacons on a seemingly endless plain. This is the land that produces the high-grade, hard, spring wheat. However, the spring-wheat region is not confined to the Red River Valley proper. It extends to the southern bend of the Minnesota River in Minnesota, south to the Missouri in South Dakota, and westward to the high plains of northwestern North Dakota, where it is limited by scant rainfall. This region produces nearly three-fifths of the spring wheat of the United States. (Fig. 16.)

Conditions are almost ideal for the growth of a superior grade of bread-making wheat. Most of the region is covered by glacial soils or by lacustrine deposits of fine black soils varying from clay-loams to heavy, black, sticky clay, or " gumbo." Most important, however, is climate. The ideal conditions for wheat are commonly considered to be a long, cool, wet spring, favoring " tillering," followed by a warm, sunny, dry harvest period. The climatic conditions are almost ideal. Most of the rain comes in spring and early summer, followed by a dry and sunny fall for the maturing and harvesting of the grain. The dry, warm ripening period is largely responsible for the large, glossy kernel, rich in nitrogen and protein, that makes the product of this region a choice flour wheat and superior to the softer grains grown in cooler and moister areas. Approximately half the rain comes from March to June, and much of the winter snow melts and enters the ground, thus providing the moisture needed early in the spring. The western limit is practically the mean annual rainfall line of 15 inches.

For many years, wheat has been the dominant crop. It is well known that the practice of growing one kind of crop year after year will ultimately cease to yield a profit. Yet it is difficult to bring about a change. A change from a single crop to mixed farming is much easier in sections east and south where rainfall is more abundant and the growing season longer. However, in a region having a short growing

season with a small margin of rainfall safety, and located long distances from market, such a change is difficult, and is commonly accompanied by much economic distress which is reflected frequently in political dissatisfaction. There is a human tendency to cling to what has been tried, especially when the chief money crop is involved. The tendency to look to the Government for the solution of geographic and economic problems is a natural result. This is illustrated by the rise of the Non-Partisan League in North Dakota and its extension to adjoining states, as Minnesota and South Dakota, and still more recently by a coalition with labor under the political banner of "Farmer-Labor." The astuteness of the political leader who can capitalize this discontent, offer a panacea, make this combination between the capitalist-farmer and urban laborer, and be elected to office must at least command respect. This mental state is not difficult to understand with an average acre yield of 8 bushels of wheat, an average annual loss of $0.10 to $3.42 an acre since 1919, a relatively falling price for wheat, high freight rates to distant markets, and a high price for commodities purchased. With a small margin of safety in rainfall, a decrease of a few inches during the growing season means a large crop loss, more economic distress, and more political determination.

Wheat, and still more wheat, remains the dominant idea. With 30–60 per cent of the crop acreage devoted to its culture, prosperity waxes or wanes with the yield and price. This is reflected in the sale of new machinery, automobiles, clothing, groceries, and the whole gamut of produce needed by the farmer. Yet, as previously noted, a change is now slowly taking place. The problem of selecting suitable crops for diversification is difficult. Hay and other forage crops (such as corn) and potatoes are migrating northward into the moister parts of the Red River Valley. The drier portions in the West are still in the agony of being reborn, and a possible new life may be found in a decrease of wheat acreage and a partial return to forage crops and live stock.

Winter-wheat Region.—Winter wheat, unlike spring wheat, is sown in the fall and attains a substantial growth during that season. It readily survives the cold of a moderate winter, especially where amply covered with snow. During the cool of early spring, it tillers more abundantly than spring wheat and sends forth many stalks, each of which bears a head of grain. Hence the yield is larger than that of spring wheat. The harvest season comes in June and early July, and requires the importation of much labor. It is a floating class of laborers that handles much of the wheat during the harvest season. These laborers start their trek (by automobile in recent years) in Texas and Oklahoma and move northward into Kansas, the Dakotas, and Canada

as the harvest season advances. The principal producing area is central Kansas, extending northward into Nebraska and southward into Oklahoma. This area produces the high-grade, hard winter variety. A minor winter-wheat area, producing softer wheat, extends through Illinois, Indiana, southern Michigan, Ohio, Pennsylvania, Maryland, and Delaware. The limits of the region of densest production are determined by climate rather than by surface or soil. The climate is not the best in the world for wheat, but wheat is the most profitable crop to grow in such a climate. The region of greatest production has a rainfall of 15–30 inches and a growing season of 150–220 days. The northern boundary is essentially the mean winter temperature line of 20° which extends from southern Wisconsin across northern Iowa and northwestward across North Dakota and Montana. Very little winter wheat is grown north of this line, yet the larger yield that may be obtained has led a number of Minnesota and Dakota farmers to "take a chance" on winter wheat. There appears to be an increasing number who are taking that "chance," and consequently winter wheat is spreading into the southern part of what has long been known as the spring-wheat region. Beyond the western boundary, which is determined by low rainfall, better returns may be obtained by utilizing the grasslands for pasture. The eastern limit is determined by heavier rainfall, which makes corn and live stock production more profitable. Toward the south, where high temperature and high humidity and rainfall stimulate fungus diseases in wheat, where the soils are more leached than in the north, and where a rainy harvest is very unfavorable, wheat comes into competition with cotton.

Winter wheat constitutes more than three-fourths of our total wheat crop. Seventy per cent of the winter wheat comes from the North Central Section, and the Kansas–Nebraska–Oklahoma hard-wheat area produces more than 35 per cent. Only five states east of the Mississippi River produce more wheat than they consume, and their surplus is not nearly equal to the consumption east of the river. Some of their wheat is exported and other wheat is brought in from the West to meet the requirements. Winter wheat, as a whole, is now on an export basis, and since the United States produces a surplus for the markets of the world, marketing of this surplus brings into relief the influence of inland location and transportation rates. Under recent rate conditions it cost (1) 29 cents a bushel to send wheat to Liverpool from Regina, Canada, by way of rail-lake-ocean through New York; (2) 35.5 cents to Liverpool by way of New Orleans or Galveston from McPherson, Kansas; and Argentine wheat reached the Liverpool market from 10 cents to 12 cents a bushel less. These figures illustrate the advantage of geographic loca-

tion, and of freight rates in favor of the Canadian and Argentine wheat producer.

Wheat is a cash crop, and the dominant one in the hard winter-wheat-producing area. Here the farmer depends almost entirely upon it for his money income. In central Kansas, from 60 to more than 80 per cent of the crop acreage produces wheat, and three-fourths of the farmers of that state grow the crop. Other products—oats, corn, rye, butter, eggs—are produced for home consumption. Hence, here as in the spring-wheat region, prosperity is governed by the returns upon the wheat crop. The average cost, from 1913 to 1923, of producing a bushel of what varied from $0.52 to $1.44, exclusive of the return upon capital invested and in recent years the losses have run from $0.70 to $2.60 an acre. Such conditions have led not only to a decrease in rural population but to the evolution of a state of mind amenable to the political-economic doctrines that have come out of the spring-wheat region, and similar to others that have risen in critical periods in the past.

The wheat farmer of the Kansas–Nebraska–Oklahoma area who considers the future and contemplates diversification is confronted with the problem of finding suitable rotating crops. The number available is distinctly limited by the small rainfall. His substitutes are forage crops—hay, millet, corn, Kafir corn, milo maize, and other sorghums, etc.,—and hence the raising of live stock. Though non-geographic factors, such as rail and water freight rates, tariffs, increased wheat consumption, etc., may direct his efforts in coming years, it seems likely that the wheat acreage will be decreased somewhat and forage crops and live stock increased relatively. The farms are also likely to remain large, as the level land is favorable to the use of machinery, and the small rainfall limits the crops to comparatively low yields per acre. Limited as it is by climate, the area is likely to continue to be a producer of wheat for bread and live stock for meat.

CORN AND MEAT

The Primacy of the Corn Crop.—Corn is both the pioneer and the premier American crop. It was one of the first crops grown on American farms, if not the first. It was being produced in America when the colonists first settled in Massachusetts and Virginia, and it was the Indian who taught them how to grow it. In 1609 the Virginia colonists had 30–40 acres in corn; in 1614, 500 acres, and in 1631 a surplus was produced for export. As the people migrated westward, corn was one of the principal crops carried with them. This westward movement of corn began immediately following the Revolutionary War and spread

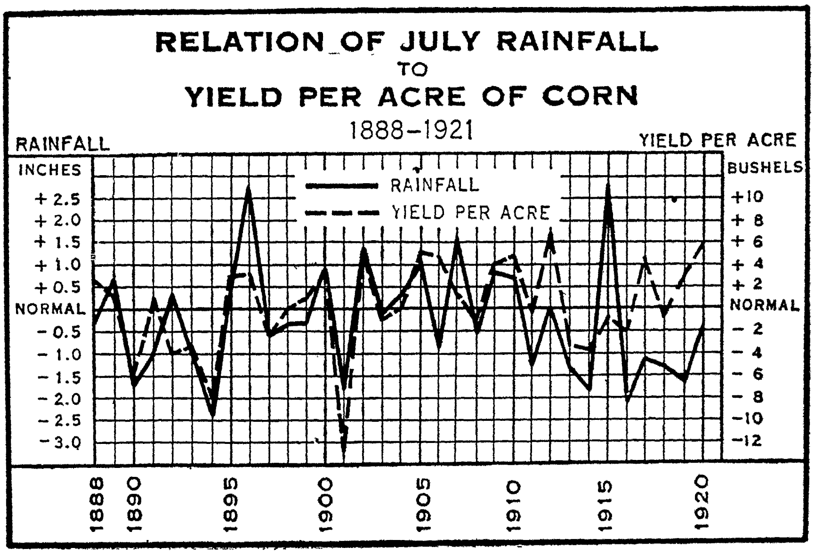
into the Northwest Territory, Tennessee, and Kentucky. By 1839 it was well across the Mississippi River. The introduction of the steel plow, especially adapted to the breaking of the prairie, and later the advance of the railroad into the region, hastened the expansion of the corn area over the prairies. Its most intensive culture became established in what has become known commonly as the Corn Belt, an area extending from central Ohio to southeastern South Dakota and thence southward along the Missouri River, occupying parts or the whole of the states of Ohio, Indiana, Illinois, Iowa, Nebraska, Kansas, and Missouri. This large area, except in the East, consists of fertile, well-drained prairie or bottom lands, easily worked.

The Corn Belt.—Though corn is widely grown in the United States, being produced in every state and on three-fourths of the farms of the country, the principal producing area is limited to the central part of the country. The principal limiting factors are rainfall, temperature, and length of growing season, though soil plays its part. The largest yields are obtained in well-drained, fertile, loamy soil of high humus and available nitrogen content and well adapted to the use of labor-saving machinery. The climatic bounds of the Corn Belt are "a mean summer temperature of 70° to 80°, a mean night temperature exceeding 58°, a frostless season of over 140 days, and an annual precipitation of 25 to 50 inches, of which 7 inches occurs during July and August."[1] Essentially, no corn is grown where the average summer temperature is less than 66° or where the average summer night temperature falls below 55°. Low summer temperatures, therefore, are the principal limiting factors at the north, while the western limit is practically the mean summer rainfall line of 8 inches. July is the critical month, and the rainfall of that month is very closely related to the yield. It is the combination of these ideal conditions of soil and climate that makes the Corn Belt the world's greatest food-producing area. Few other places possess these ideal conditions, and none are as extensive. (Fig. 108.) The northern and southern limits of corn grown for grain are now practically reached, though early-maturing varieties and growth for forage or green fodder may extend its culture still farther north. The warm, moist conditions of the South produce a large vegetative growth but low-quality grain.

Corn is not the only crop grown in this great agricultural region. In fact, it is grown on less than half of the crop lands in the Corn Belt. More than half of the agricultural land grows hay and small grains. These may be harvested when labor is free from corn cultivation; they supplement corn as stock feed; and they maintain the soil fertility.

[1] Finch and Baker, Geography of World Agriculture, p. 29.

Temperature, moisture, and soil are the important factors determining the choice of such crops. In the northern part of the Corn Belt, from northwestern Indiana to northeastern Nebraska, oats is the principal small grain, and on the south and east it is winter wheat. West of a line extending from Kansas City, Mo., to Sioux City, Iowa, crossing the other two small-grain sections, alfalfa is the chief hay; and to the east, clover and timothy. This selection is determined largely by the moisture supply to the east and west of this line. The Corn Belt is, therefore, a large producer of spring oats, clover, timothy, alfalfa, and winter



Agricultural Yearbook, 1921.

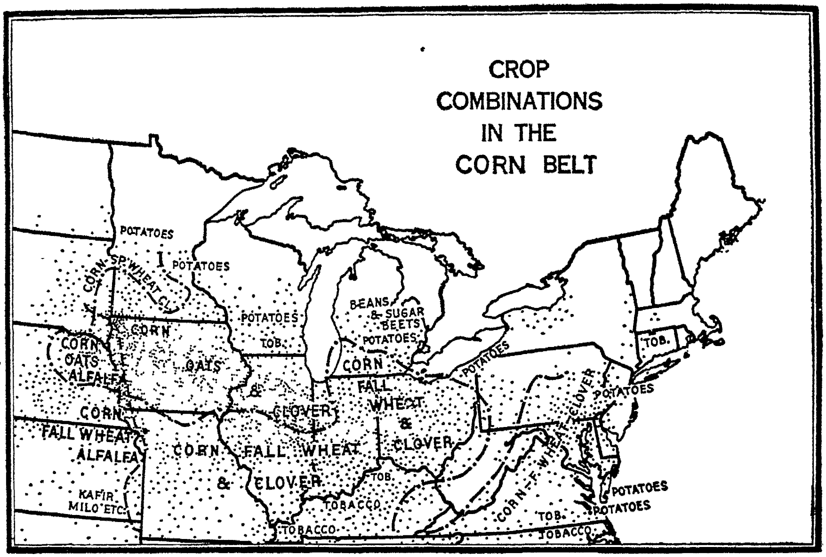
FIG. 108.

July is the critical month in the growth of corn in the Corn Belt. The very close relation between yield and July rainfall in Indiana, Illinois, Iowa, and Missouri is very strikingly shown in this diagram.

wheat. (Fig. 109.) The relative importance of this production is shown in Table IX. Closely related to the production of these crops is the raising of hogs, beef cattle, and poultry.

Importance of Corn.—Corn is America's leading crop. Its value in three out of four years is greater than the total value of wheat and cotton, and usually double the value of either. Nearly a hundred million acres is devoted to it, and out of 6.4 million farms in the United States in 1919, 4.9 million grew corn. It is typically an American crop, as the United States produces about three-fourths of the world's crop, more than half of which is produced in the Corn Belt. As a food producer it is prolific

as it yields twice as much grain and, inclusive of forage, more than three times as much food per acre as either oats or wheat. Directly and



Courtesy U. S. Department of Agriculture.

FIG. 109.

The dots represent corn acreage. Less than half the land in the Corn Belt grows corn in any given season. More than half the land grows small grains and hay, and less than 1 per cent is devoted to intertilled crops other than corn.

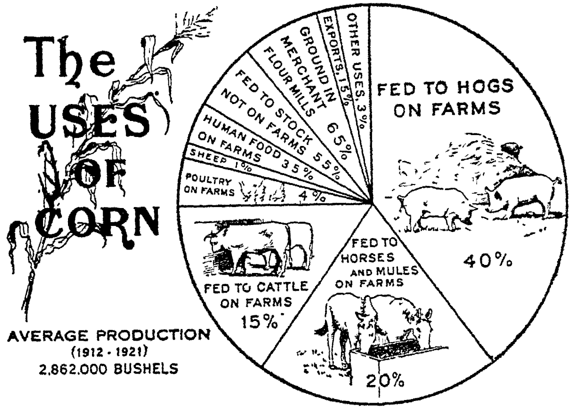
indirectly, it is the chief food source of the American people. However, outside of the South, less than 10 per cent is used directly as human food.

TABLE IX

PROPORTION OF SELECTED PRODUCTS OF THE UNITED STATES PRODUCED IN THE CORN BELT STATES

1. 65.7 per cent of value of slaughtering and meat-packing products
2. 54.7 per cent of corn
3. 54.4 per cent of hogs
4. 44.3 per cent of oats
5. 40 per cent of all poultry
6. 40.0 per cent of chickens' eggs
7. 40.0 per cent of all wheat
8. 36.6 per cent of cattle other than milk cows
9. 34.0 per cent of hay and forage
10. 27.7 per cent of milk cows
11. 26.0 per cent of total value of manufactures
12. 18.5 per cent of small fruits
13. 13.3 per cent of apples
14. 12.7 per cent of all fruits and nuts

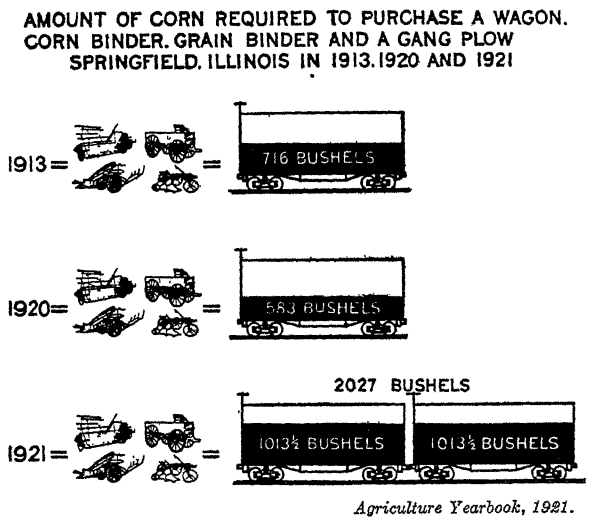
Corn, hogs, and cattle are intimately related. (Figs. 19, 26, 27, 114.) The regions of densest hog and corn production are practically identical, except where corn is sold as grain. The sale of corn as grain is usually determined by nearness to large markets, such as Chicago where it is manufactured into starch, corn meal, glucose, or other corn products. Beyond a radius of 150–200 miles from that center, corn goes to market "on the hoof," as in such concentrated form it can better stand the cost of transportation, since 10–12 pounds of corn are concentrated into 1 pound of beef, and 5–6 pounds into 1 pound of pork. More than half of the hogs, one-fourth of the milk cows, and more than one-third of other cattle are produced in the Corn Belt. Great numbers of cattle and sheep are brought in from the western grassland plains and fattened for the market. Hogs and



Courtesy U. S. Department of Agriculture.

FIG. 110

Corn consumed directly or in the form of animal products, is the chief source of food of the American people. More than 85 per cent of the crop is fed to live stock, less than 10 per cent being used directly as human food.



Agriculture Yearbook, 1921.

FIG. 111.

In 1921, 3.5 times as much corn as in 1920 was required to purchase farm machinery, and 2.8 times as much as in 1913.

cattle on farms alone consume 55 per cent of all of the corn crop; poultry, 4 per cent; sheep, 1 per cent; and horses, 20 per cent. Scarcely

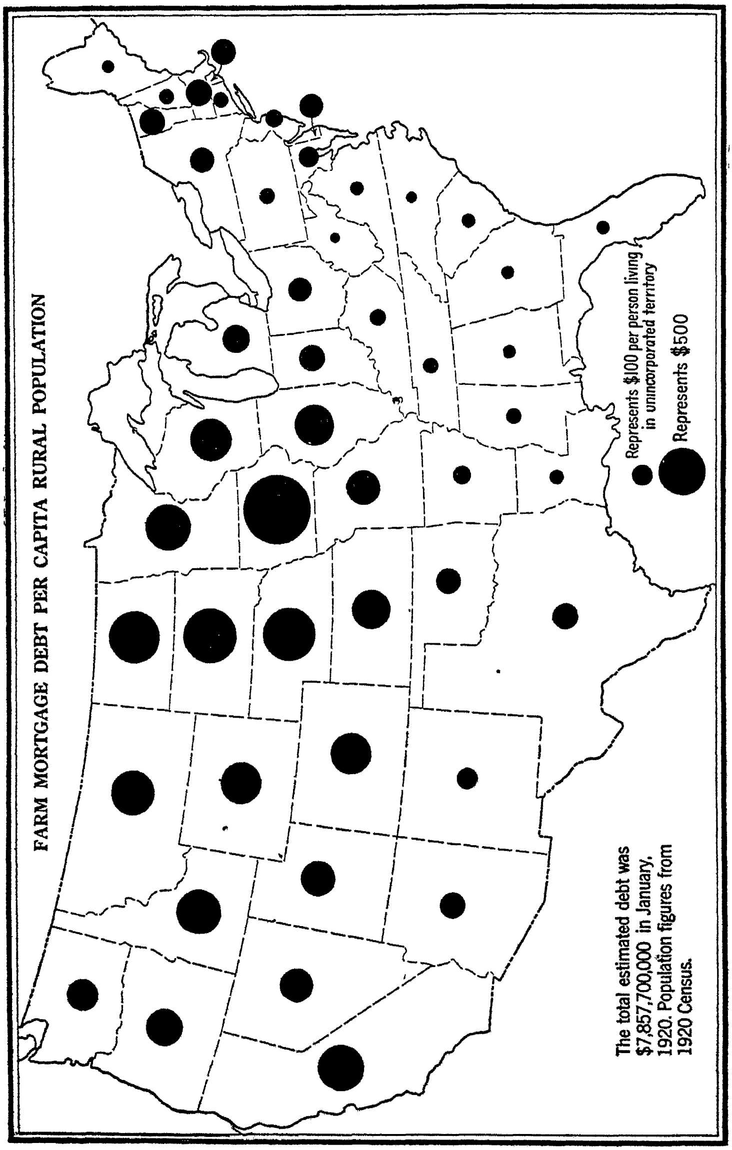
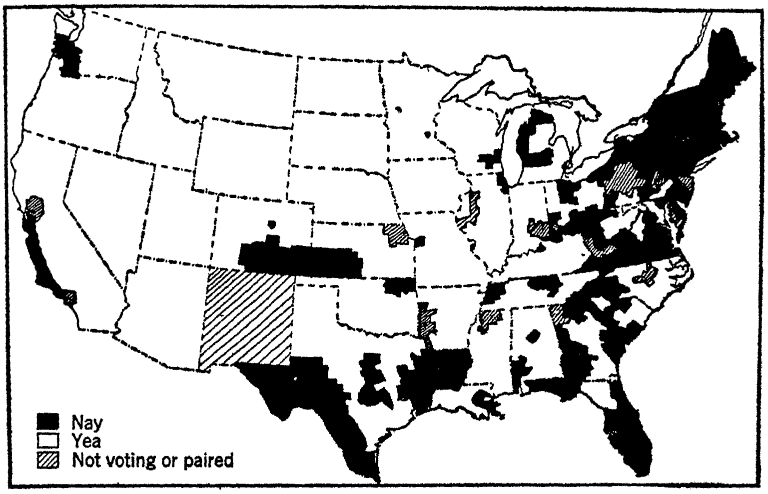


FIG. 112.

The farm mortgage debt per capita of rural population is largest in the North Central States and in the West. In Iowa it is nearly $1050 per capita. Compare with Figs 111, 113

a quarter of the crop goes out of the county in which it is grown, and less than 2 per cent finds a foreign market, a condition that is in striking contrast to wheat marketing. (Fig. 110.)

The Present and Future of the Corn Region.—For many years the efforts of the Corn Belt farmer have been directed toward producing larger and larger crops. Ideal geographic conditions and a hungry world population able to pay for high-quality food have fostered his efforts. The world demand for corn-fed beef, pork, and other corn products have made corn the most profitable crop that could be produced in the Corn Belt. Land values rose rapidly to high levels during the War period, along with prices of products. Modern conveniences were added to farm homes, and many other improvements were made. At the close of the War, prices of corn products declined more rapidly than the commodities purchased by the farmer, until more than three times as much corn



Courtesy American Farm Bureau Federation.

FIG. 113.—Distribution of Votes in the House of Representatives on the McNary-Haugen Farm Bill (1927).

Is there any indication of the influence of geographic environment shown? Compare with Fig. 112.

was required to purchase farm machinery as in 1913. (Fig. 111.) At the same time, the cost of moving his products remained high. In the census year (1919), 41.6 per cent of the farms in the Corn Belt states were mortgaged, but the mortgage debt was only 22.4 per cent of the value compared to 29.1 per cent of the United States as a whole. Decrease in land values since that date undoubtedly have changed this ratio unfavorably to the Corn Belt farmer. (Fig. 112.) High-priced farm property, increasing ratio of debt to property value, declining price and demand for Corn Belt products in Europe, relatively high freight rates, and large production have combined to produce a decrease in rural

population and much economic distress. As in the wheat regions, this situation has been reflected in Government affairs, and the North Central Section is developing rapidly a sectionalism finding expression as an agrarian *bloc* in American politics. (Fig. 113.) In this respect the history of the Corn Belt is not unlike that of other sections of the United States in which the people have in the past reflected the dominant interest of their environment or do so to-day. Perhaps another epoch will see an adjustment of production to consumption and a counterbalancing influence brought about by the further development of manufacturing and commerce. It seems probable that climate and soil will continue to make the present types of products the most profitable ones to produce in the Corn Belt.

HAY AND FORAGE—DAIRYING

Importance of Hay and Forage.—Hay and forage constitute one of the most important crops produced in the United States. The term includes a great variety of both cultivated and wild grasses, of which timothy, clover, alfalfa, and prairie are the leading ones. Most of the prairie hay and alfalfa are grown in the drier western portion of the North Central Section, while the others thrive best in the more humid and cooler eastern portions. The growth of hay and forage is not restricted by geographic conditions and hence is widespread, being adapted to climates ranging from hot to cold and humid to arid, and also to a great variety of soils. Abundant moisture during the growing season, with little rain and much sunshine during the curing period, and well-drained clay soil are conducive to successful production. Its selection as a major crop in a given area is the joint result of geographic and economic factors. The large amounts required for stock feed make it the second most important crop in the North Central States, where more than half the crop of the United States is produced. These states have nearly half (48.8 per cent) of the dairy cattle, and produce half the milk, three-fifths of the butter, and seven-tenths of the cheese. As population increases there is a tendency to increase crop land at the expense of pasture land, and thereby materially increase the acre yield. Under present conditions, permanent agriculture has its most substantial basis in the production of forage crops and live stock, which means a system of general farming. Such a system is enduring because (1) legumes constitute many of the forage crops and add nitrogen to the soil; (2) the decaying fine roots of grasses provide nourishment for nitrogen-fixing bacteria, add humus to the soil, and serve to keep it in excellent tilth; (3) animal manure is unexcelled by any artificial fertilizer; and (4)

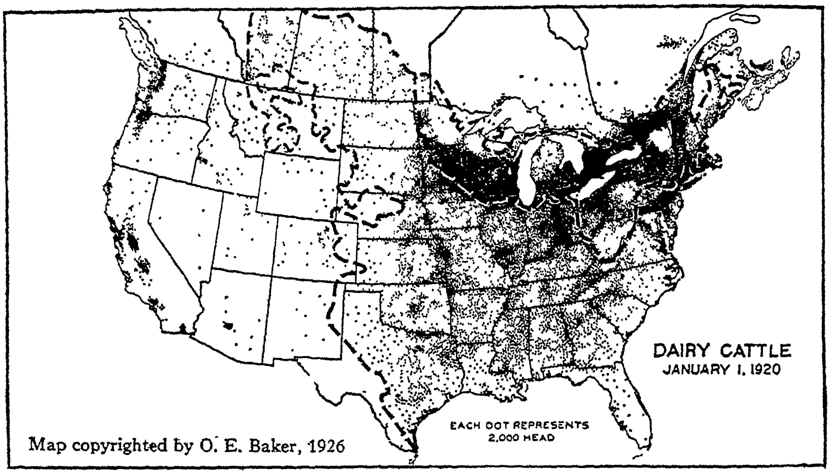
the system tends to maintain economic stability. From the standpoint of value, dairy cattle comprise the most important type of live stock on our farms to-day.

Specialization in the North.—The northern region has passed through several periods of agricultural development and has attained a more advanced stage than have most other parts of the North Central Section. The exploring-hunting stage was followed by pastoral husbandry, when the pioneer settlers pastured a few cattle and sheep in the forest lands. Then came specialization in grain growing, as transportation facilities, such as railroads, canals, and lakes, became available for marketing the crops; and finally came the system of mixed farming in which hay and forage and dairying became dominant, a system associated with a denser population than normally exists at the other stages named. A number of geographic, economic, and human factors have fostered, in southern Wisconsin, Michigan, and Minnesota, and the adjacent northern edge of the Corn Belt, the development of hay and forage and the dairy industry. This development is in contrast with that of the wheat regions and of the Corn Belt in which one crop dominates agricultural economy. Among these influencing factors are the long winters, the cool, moist summers with moderately long growing and grazing season, which discourage the growth of grain in competition with more favorably endowed areas, but encourage dairying; abundant rain in frequent showers during the growing season but with little rain and much sunshine during the curing period; slight injury from drought; heavy snow cover which prevents serious loss from freezing; a glacially derived surface containing much hilly morainic land, many lakes and swamps, soils ranging from silts to sand and gravel not well suited to the growth of corn and other cereals; a fairly large population with a constant city demand for dairy products; a large population of north-European human stock familiar with the dairy industry. (Fig. 114.)

The extent of the adjustment to hay and forage and dairying in the northern region, of which Michigan, Wisconsin, and Minnesota constitute the major part, is evidenced by the ratio of production. Here is produced nearly a fifth of the hay and forage of the United States, a sixth of the butter, two-thirds of the cheese, and a fifth of the milk; two-thirds of the hay and forage of the North Central States, a third of the butter, nearly all the cheese (96 per cent), and two-fifths of the milk. The value of the dairy products of the region form more than a fourth (28 per cent) of the total value of all dairy products produced on farms,[2] in the United States, and nearly three-fifths (58 per cent) of the value

[2] Exclusive of value of finished products of creamery and cheese factories, a total which would greatly increase ratio given.

similarly produced in the region. The value is also more than a fourth as large as the total value of all crops. The significance of hay and forage is also shown by the fact that from one-fourth to four-fifths of the crop acreage is devoted to it. Near city centers of dense population where modern rapid transportation facilities have been provided by railroads, electric trains, and automobile trucks, a large proportion of the product goes to market as milk; and at more distant points the milk is condensed or converted into butter and cheese, which can better stand the cost of transportation.



Courtesy O. E. Baker and Economic Geography.

FIG. 114.

Nine-tenths of the dairy cattle are in the East. Nearly half are in the cool Hay and Dairying Region and in the adjacent eastern and northern margin of the Corn Belt. They are more numerous than beef cattle in the northern part of the Cotton Belt but much less numerous in the Great Plains and arid western plateau and mountain section.

Wisconsin the Leading State.—Wisconsin is the leading dairy state. Two-fifths of its commercial milk is made into cheese. Nearly the same proportion (39 per cent) produces butter, and a little more than a tenth is condensed. Its cheese output is nearly two-thirds that of the entire country, and its foreign cheese—Swiss, Limburger, brick—is four-fifths. Minnesota exceeds it in the production of butter and is now the leading butter state, but Wisconsin ranks second. The adjacent northern portion of Illinois, near the large city markets, likewise has a highly developed dairy industry. The premier position of Wisconsin is due to a combination of geographic, economic, and human factors. Its geographic and economic advantages are no better than exist elsewhere, but the influence of scientific research and able leadership has been pro-

found. The contributions and far-sighted campaign of education of former Governor Hoard, Professor Babcock, and the State College of Agriculture of the University, among a people ancestrally, and in many cases personally, trained in dairying, and living in a physical environment

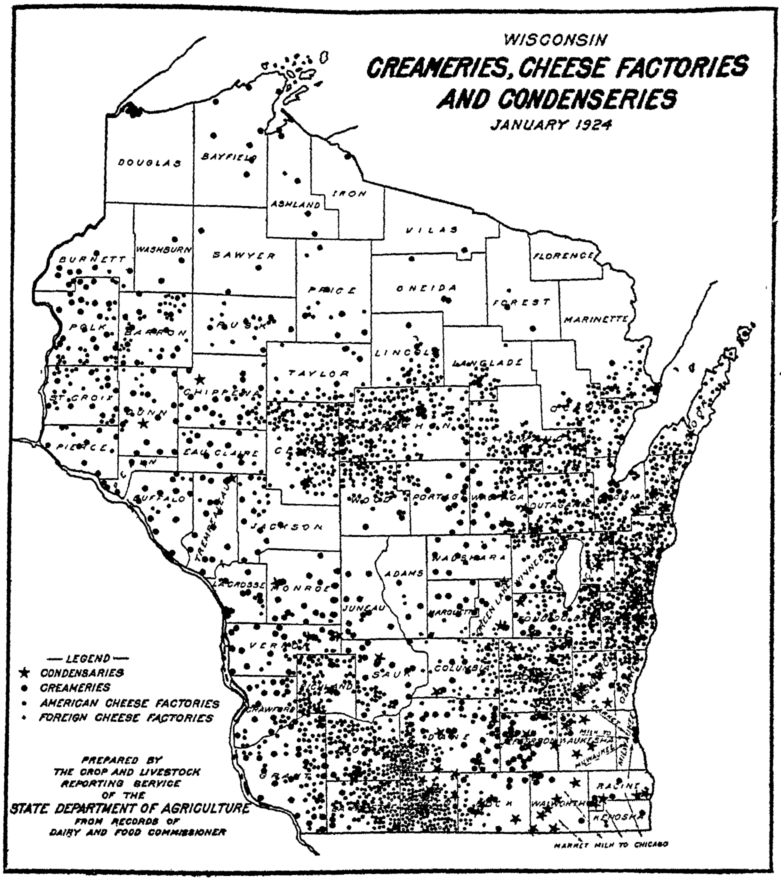


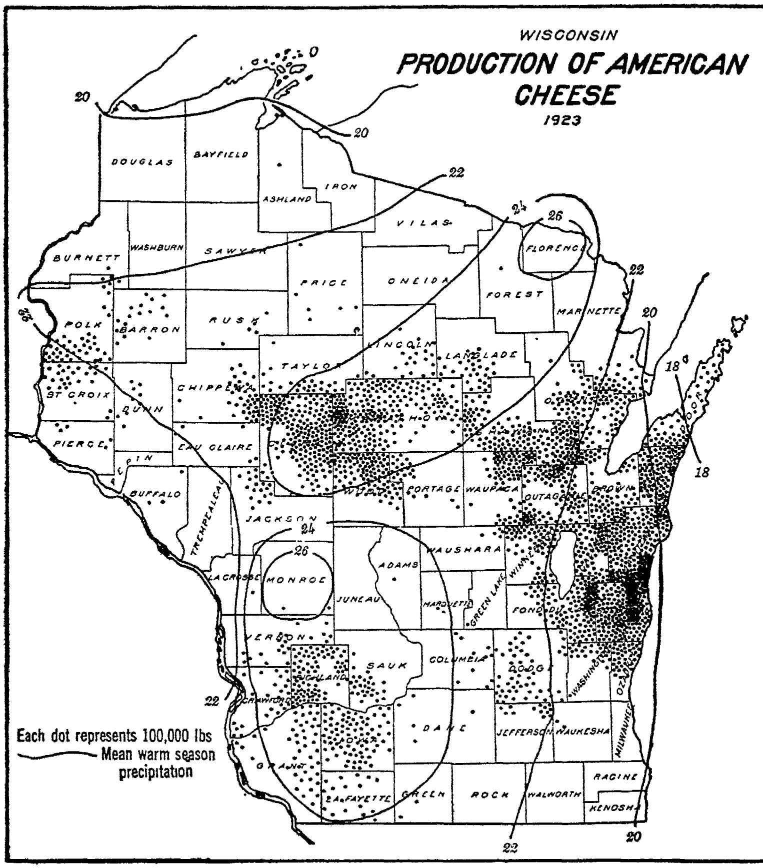
Fig. 115.

Creameries and cheese factories are concentrated chiefly in three sections—the eastern part of the state, the southwestern, and the central. The southeastern counties produce market milk for Chicago, Milwaukee, and other cities.

highly conducive to the industry, have wielded a large influence in producing a stable agricultural system. (Figs. 115–117.)

Dairying is the most important phase of Wisconsin agriculture and is well distributed over the state except in the forested, sparsely settled north and in the central region of poor, sandy soil. With nearly two-thirds of the land area in farms, and with about a third of that improved,

more than two-fifths (45 per cent) of its crop acreage is devoted to hay and forage, and the value of its dairy products is more than two-fifths as large (46 per cent) as the total value of its crops. Four-fifths of its 2870 dairy establishments are cheese factories, and the total value of



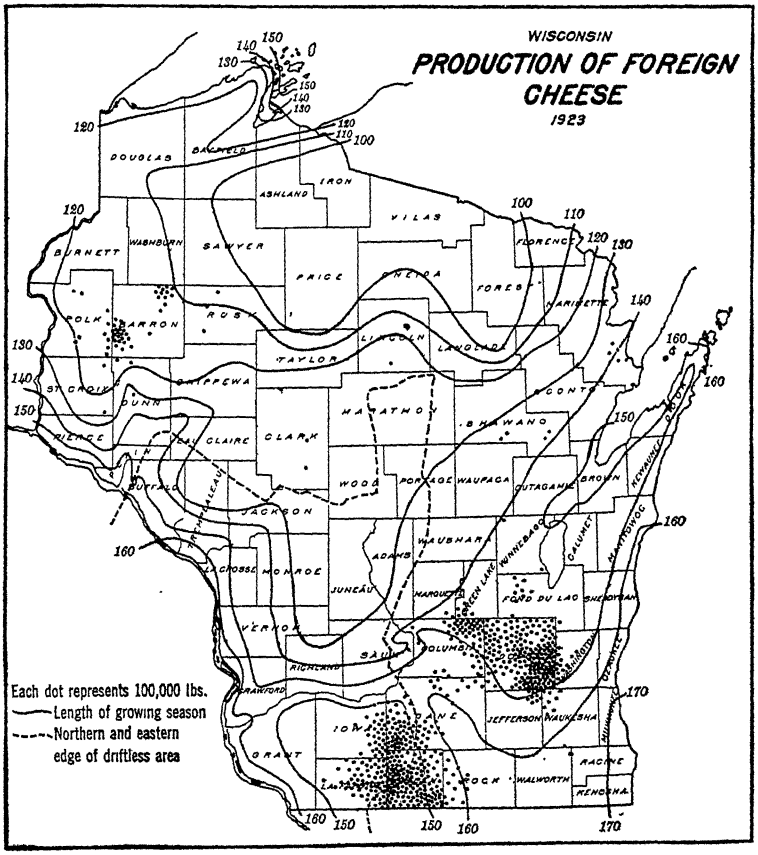
After map by Wisconsin State Department of Agriculture.

FIG. 116.

The cheese industry has become concentrated along the cool Lake Michigan shore, and in the highlands of the southwest and central districts, where pasturage is abundant and where climate, soil, and surface are not conducive to a winter-dairying, butter-producing, hog-raising system of agriculture.

their output ranks them fourth among the state's manufacturing industries. These plants are located chiefly in the east near Lake Michigan, and in the higher, rougher, unglaciated limestone lands of the southwest, where the nights are cool and where corn does not thrive. The creameries are most abundant in the corn-growing section and are an adjust-

ment to summer and winter dairying, while cheese is mainly a response to summer dairying. The chief American cheddar cheese area is in the eastern Lake shore section where the pioneer New Yorkers transplanted the industry and where the large German element in the population



After Map by Wisconsin State Department of Agriculture.

FIG. 117.

Nearly all the foreign cheese is produced in and adjoining Green County, located in the southeastern edge of the Driftless Area, and in Dodge County a few miles to the northeast. Compare with Figs. 115 and 116

took it up and contributed to its successful development.[3] About three-fourths of the American cheese produced in the United States now comes from Wisconsin.

[3] Glen Trewartha, The Dairy Industry of Wisconsin as a Geographic Adjustment. Bul. Phil. Geog. Soc., Vol. 28 (1925), p. 22.

The production of so-called foreign cheese is confined largely to the two chief areas, of which Green County, in the driftless limestone southwest, and Dodge County, in the glaciated limestone soils about 30 miles northeast of the first area, are the respective centers. The Green County area is a Swiss settlement, and the brick cheese of the Dodge County area was originated by a young Swiss. The first area produces 96 per cent of the state's Swiss, and 98 per cent of the Limburger cheese, and the second area 75 per cent of the brick cheese. The high degree of specialization in the Green County area is evidenced by a production of 70 per cent of the Swiss cheese of the United States, 45 per cent of the Limburger, and 8–10 per cent of the brick. Three of the four rural counties of the state having the highest per capita assessed value of real and personal property are in the southwestern foreign-cheese area. This per capita value in Green County is two and one-half times that of the urban county, Milwaukee, and only slightly less than that ratio for the other two.

MICHIGAN FRUIT BELT

A narrow belt along the western side of the Lower Peninsula of Michigan is one of the most important fruit-producing regions of the United States, chiefly because of the climatic influence of Lake Michigan. This belt produces great quantities of grapes, peaches, pears, apples, and small fruits. In these border counties is produced seven-tenths of the total value of all fruit of the state, which is three and one-half times that for the entire state of Wisconsin, located on the windward side of the Lake. The value of the fruit produced in Oceana County in Michigan is sixteen times that of Sheboygan County, directly across the Lake in Wisconsin; and that of Berrien County, Michigan (in the extreme southwest) is five and one-half times that of all the Wisconsin counties bordering the Lake, and more than a fifth greater than that of the entire state. Door County, which receives the moderating influence of Green Bay from the west and of Lake Michigan from the east, is the only Wisconsin County that compares favorably with Michigan counties along the eastern shore of the Lake. (Fig. 118.)

Climate, Lake Michigan, sandy loam soil, and nearness to large city markets are the principal factors that have influenced the development of the Michigan fruit belt. The potency of Lake Michigan in raising the temperature and moisture content of the westerly winds, and in retarding early spring growth, is much greater in Michigan than in Wisconsin. This influence extends some 20 miles or more inland from its leeward shore and may be summarized as follows: (1) In spring the cool

westerly winds from the Lake retard plant growth until the danger from frost is past and in autumn the relatively warm winds delay the first killing frosts until the more tender trees are ready for the winter. (2) A growing season of about 160 days prevails along the Michigan shore nearly to the northern extremity of the Lower Peninsula but decreases

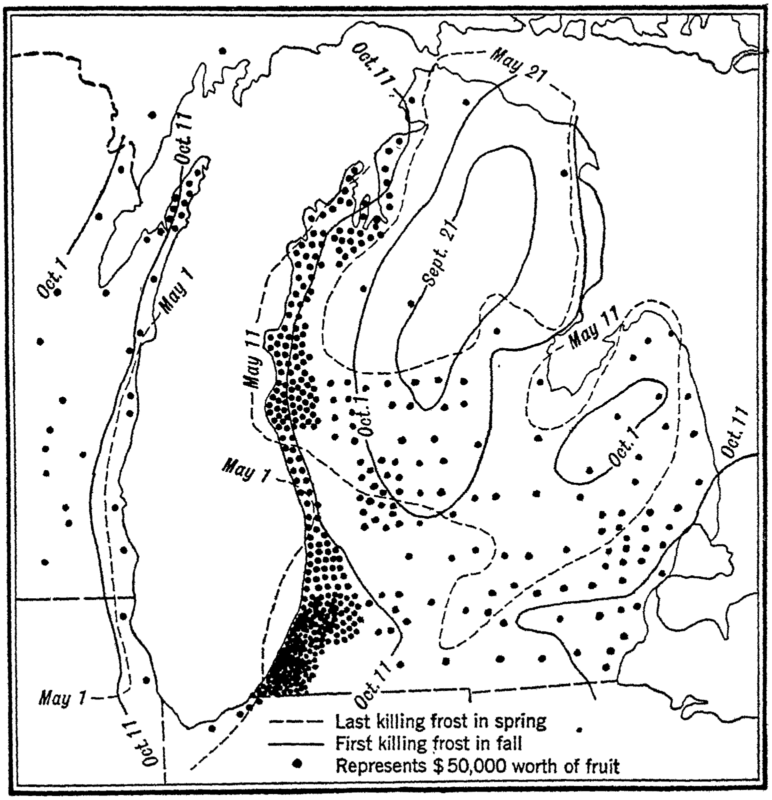


FIG. 118.

Lake Michigan and the westerly winds are powerful factors in modifying the climate of western Michigan, and in determining the kinds of crops produced. In this narrow belt along the leeward Lake Michigan shore is produced seven-tenths of the total value of all fruit grown in Michigan, and three and one-half times that for the entire state of Wisconsin situated on the windward side of the Lake.

rapidly in length toward the northern interior. This gives the northern Lake shore as long a growing season as the southern interior of the state. However, the length of the growing season is not greater than on the Wisconsin side. (3) The winter temperatures are much milder along the Michigan shore than in Wisconsin, and the extreme minimum temperature is never as low. The critical temperatures of −15° to −20°,

which kill the buds, seldom occur on the Michigan shore but occur nearly every winter on the Wisconsin side. (4) The extreme summer temperatures are 6° to 10° lower on the Michigan shore than in the interior of the state. This is a large factor in the development of an extensive summer-resort business as well as in the production of fruit. (5) The snowfall of the Michigan shore counties is 10 inches to 20 inches greater than in the interior of the state or on the Wisconsin side. The percentage of winter cloudiness and summer sunshine is also greater than in Wisconsin, both of which favor fruit growing. The moist winters, which reduce the loss from "winter killing," and the delayed springs are probably the two most important climatic factors favoring the leeward shores of Lake Michigan as a fruit region.

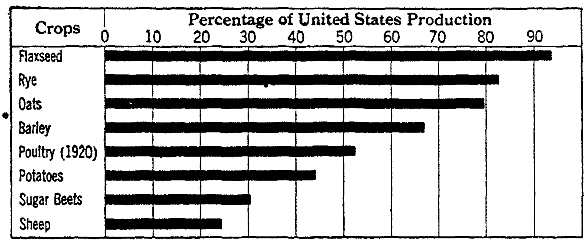


FIG. 119.—Minor Agricultural and Pastoral Products of the North Central States. Average, 1922–1924.

Though these crops are secondary yet the North Central States produce a high proportion of the total output of the United States

OTHER CROPS AND LIVE STOCK

While there is crop and live stock specialization in the various agricultural regions previously described, yet these regions produce a large variety of other important agricultural products. The chief major producing sections of barley, rye, potatoes, sugar beets, tobacco, and flax are north of the Corn Belt, in regions of cooler summers and shorter growing seasons. Oats are grown extensively in the Corn Belt for stock food, and as a spring-sown crop in the system of rotation, but their culture extends to the northern border of the United States. Enormous quantities of eggs and poultry meat are produced in the North Central Region, most of it coming from grain and stock farms rather than from specialized poultry farms. Sheep raising came into the region during its early settlement and has been retained as part of the farming system, especially in southern Michigan and in Ohio where sheep are better adapted to the hilly pasture lands in the southeastern quarter than are cattle. With the exception of limited areas, sheep are now produced primarily for mutton. (Fig. 119.)

PROBLEMS

1. Can the North Central Section maintain a population as dense as that of Germany?

2. Can the North Central Section maintain its position as the leading agricultural region of the United States?

3. Does prosperity in the Corn Belt depend upon the corn crop?

4. What change in the center of production of each of the leading crops of the North Central Section is likely to occur within the next century?

5. Will a law similar to the McNary–Haugen Bill solve the problems of the farmer in the North Central Section?

6. To what extent are geographic factors responsible for agricultural prosperity in the North Central Section?

7. To what extent are the farmer, manufacturer, banker, transporter, and city dweller interdependent?

8. To what extent does the prosperity of the American farmer depend upon the prosperity of people in other parts of the world?

9. What states may equal or excel Wisconsin in dairying?

CHAPTER X

THE INDUSTRIAL LOWER LAKE REGION

A Region of Manifold Industries.—The industrial Lower Lake Region includes southern Michigan and Wisconsin, Ohio, Indiana, and Illinois, to which St. Louis is closely allied. It is a region of

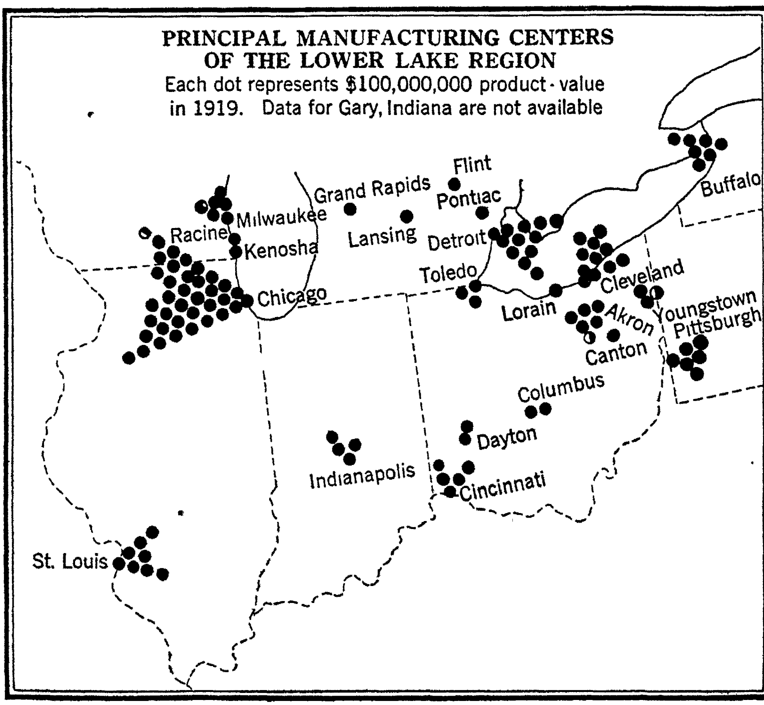


FIG. 120.

The Lower Lake Region is part of the major manufacturing section of the United States. It includes parts of the Corn Belt, Hay and Dairy Region, and Corn and Winter Wheat Region. Among its varied industries several of the leading ones depend upon agriculture for raw materials, or for a market for their finished products. Compare with Figs. 16 and 55.

agriculture, mining, manufacturing, commerce, trains, boats and many large cities. Among its people engaged in gainful occupations, 37 per cent are in manufacturing industries, 19 per cent in agriculture, and 18

per cent in transportation and trade. Here are produced and collected great quantities of raw materials—iron ore from the north, coal from Illinois, Indiana, and the East, salt, forest products, rubber, petroleum and other minerals, wheat, oats, cattle, hogs, and many other farm and orchard products. These materials are fabricated into a multitude of finished articles—products of slaughtering and meat packing, of iron and steel plants, and of foundry and machine shops, automobiles, agricultural implements, rubber tires, engines, clothing, boots and shoes, *ad infinitum*—to meet the wants of people in all parts of the world. It possesses a remarkable combination of vital resources that integrate so as to make it approximately an economic unit. They probably provide better for an all-round development than do the natural resources of any other section of the United States, and probably are unequaled in that respect outside the north central plains of Europe. In addition to the resources within its bounds, the coal power of Pennsylvania, West Virginia, Kentucky, and Tennessee may be drawn upon. However, its inland location places upon it a freight-cost handicap in competition with the East which partially negatives the advantages accruing from its superior wealth of natural resources. Since the upper waters of America's two great waterways—the Great Lakes–St. Lawrence, and the Mississippi—are but a short distance apart, a practical commercial connection is likely to come ultimately. Such a connection will lessen but not remove entirely the disadvantage of location, as there are many economic factors unfavorable to long inland canal and river navigation compared with all-year transportation on the modern railroad. To-day the Lower Lake Region is covered with a close network of excellent railways and is traversed by the main transcontinental lines of the country. (Fig. 120.)

FUEL AND POWER

Coal.—Coal, probably even more than iron, is the most important factor in modern manufacturing development. Two of America's most important coal fields are located partially within the region, and one of the minor fields is confined to Michigan. (Fig. 35.) Nearly all the Eastern Interior Field lies in Illinois and Indiana, and part of the Appalachian Field is in Ohio. Illinois, Ohio, Indiana, and Michigan now produce a quarter of the annual output of the country, and the first three rank third, fifth, and sixth respectively, among the states in the amount mined annually. (Fig. 123.) Michigan produces only about a million tons, which is used locally, as better coal can be obtained easily. The reserves of bituminous coal are enormous. These of the Northern and Eastern

Interior Fields, which lie wholly or largely in the Lower Lake Region, are approximately 320,000 million tons, and those of the three fields constitute more than half (about 55 per cent) of the total bituminous reserves of the United States. The presence of these coals as a power source, in the midst of a rich agricultural region, has been a large factor in the rapid manufacturing development, in the growth of transportation facilities by rail and boat, and in the growth of such centers as St. Louis, Kansas City, Chicago, Cleveland, and many other Lake cities where the coal meets the iron ore and where the products of the factory may secure cheap transportation. Coal as raw material has likewise given rise to coke and gas plants and to the production of many by-products.

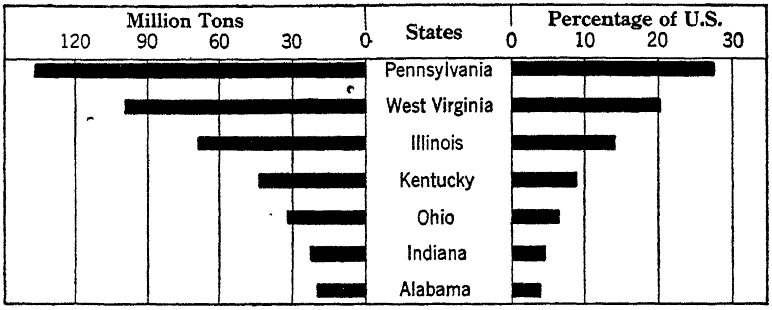


FIG. 121.—Bituminous Coal Production by Leading States. Average, 1922–1924.

Three of the seven leading coal producing states are in the North Central Section. They produce a fourth of the bituminous coal of the country, an amount nearly half as large as Germany's total output of high and low grade coal. Compare with Fig. 35.

Petroleum and Natural Gas.—As petroleum and natural-gas production spread westward from Pennsylvania, Ohio, Indiana, and Illinois became leading states. But oil and natural gas are ephemeral bases of industry, as a large output continues for only a relatively few years in any field. Many villages were born, grew rapidly with the rise of the oil and gas industry, and sank into insignificance with its decline. For many years, petroleum and natural gas wielded a large influence in the industrial development of the region, and they are still of considerable importance. However, the production is now small compared with that of other fields. The combined output of Illinois, Indiana, and Ohio is only a tenth of that of Oklahoma, and 8 per cent of that of California. The refining of petroleum remains a large industry, as oil is brought through pipe lines from the western fields.

MAJOR INDUSTRIES

A Highly Developed Manufacturing Region.—The Lower Lake Region possesses the essentials for successful manufacturing development: (1) abundant power, (2) abundant raw materials of great variety, (3) abundant labor and capital, (4) excellent transportation facilities, and (5) excellent, accessible markets both within and without the region. Cities and manufacturing centers at focal points along the Lake shores profit by the great advantage of location. Veritably, they are creations of the Great Lakes; born but yesterday, their growth within the short life-span of a man has been phenomenal. (Fig. 122.)

The industries of the region are almost as varied as human wants, although food products, founded upon the basic industry of agriculture,

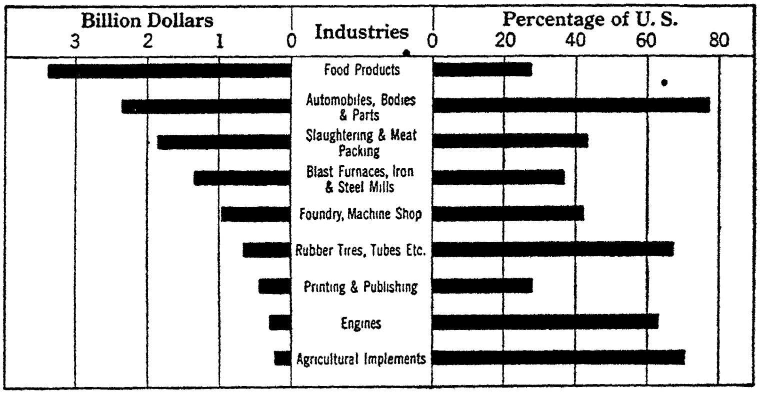


FIG. 122.—Typical Industries of the Lower Lake Region. Census of 1920.

The manufacturing industries of the Lower Lake Region are large and varied whether measured by product-value or by percentage of the country's total production.

rank first in value. The Lower Lake Region has more than half the population of the North Central States, produces nearly three-fourths of the manufactures measured by product-value, and has four-fifths of the wage earners. The value of the manufactures forms about a fourth of the total for the United States. Measured by product-value, this region produces more than a fourth of the manufactured food products; three-fourths of the automobiles, bodies, and parts; seven-tenths of the agricultural implements, and nearly a like proportion of the rubber tires and other rubber goods; nearly two-thirds of the engines; more than a third of the products of blast furnaces, and iron and steel mills; more than two-fifths the foundry and machine shop, and slaughtering and meat-packing products; and has more than a fourth of the printing and publishing business of the country.

Slaughtering and Meat Packing.—Among the food products, slaughtering and meat packing ranks first in value of products though its net value is relatively small. The industry is by no means confined to the Lower Lake Region. However, the high cost of shipping live animals, the loss sustained by injuries and in weight in shipping them, and the fact that only about half the live weight is meat have tended to centralize slaughtering and meat packing in the Corn Belt and on its margin. The principal centers of the United States are Chicago, New York, St. Louis, East St. Louis, Omaha, Kansas City, St. Paul, St. Joseph, Denver, Indianapolis, and Sioux City. (Figs. 123–125.)

At the beginning of the nineteenth century live stock of the Central West had no market except a local one; but early in that century cattle were driven across the mountains from the Ohio Valley to the markets of Baltimore, Philadelphia, and New York. This method of marketing later extended to Indiana, Illinois, and Kentucky, and ended with the establishment of railroad connections with the East. As the railways were built still farther west, "cattle drives" from Texas and the high plains to "cow towns," located at the end of the rails, were organized. As the rails were pushed on still farther and farther west, new "cow towns" arose at their termini. As the development of transportation was a controlling factor in the westward expansion of cattle raising, making it possible to ship animals to distant markets, the development of refrigeration (1875–85) and other methods of preserving meat, transformed the slaughtering industry from a local one to one of large-scale production at great railroad foci in the food- and animal-producing section, and made the world a market for meat products. Before the perfection of refrigeration, slaughtering was largely a winter industry and ceased almost entirely during the warm summer months except in very large consuming centers. With rapid transportation, refrigeration, a population able to buy such high-quality food as meat, and the concentration of the industry at great centers, have arisen giant corporations able to effect economies to a high degree and to utilize every part of the animal. A single Chicago meat-packing concern has 8 other plants, 60,000 employees, 400 distributing plants, and 7000 refrigerator cars. It can slaughter 57,000 animals daily, and its total annual sales of meat and allied products are more than a billion dollars. Chicago was one of the first important centers and is still the leading one. Its stockyards receive more than 17,500,000 animals annually, and the output of its meat-packing establishments is valued at more than a billion dollars, exclusive of the numerous by-products, which is more than a fourth of the total for the United States.

Flour Milling.—Flour milling is as typical of the North Central Region as are slaughtering and meat packing and the manufacture of

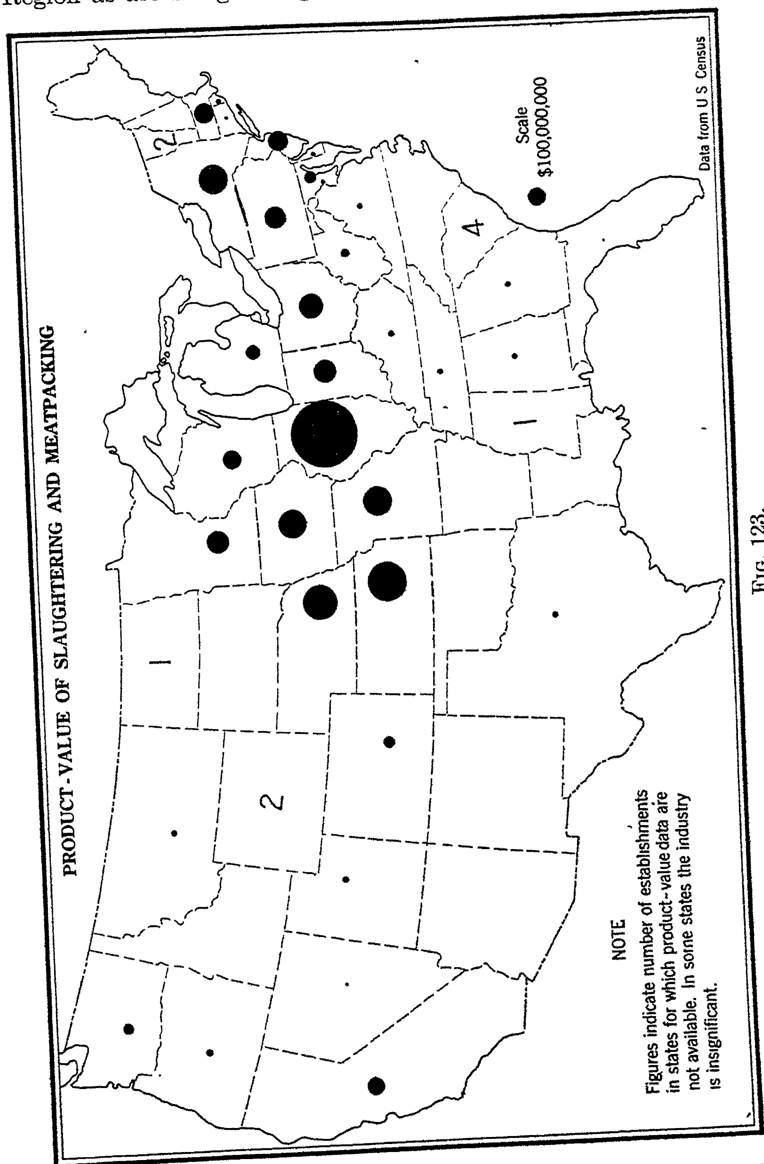
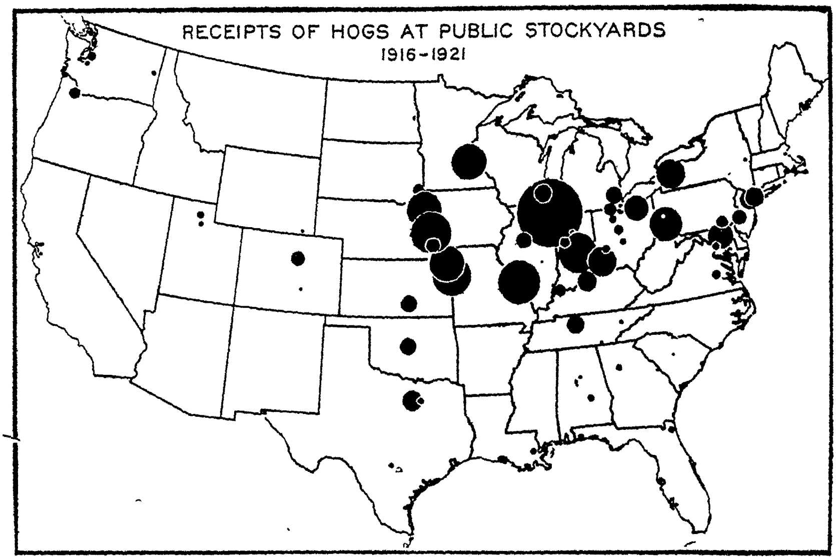
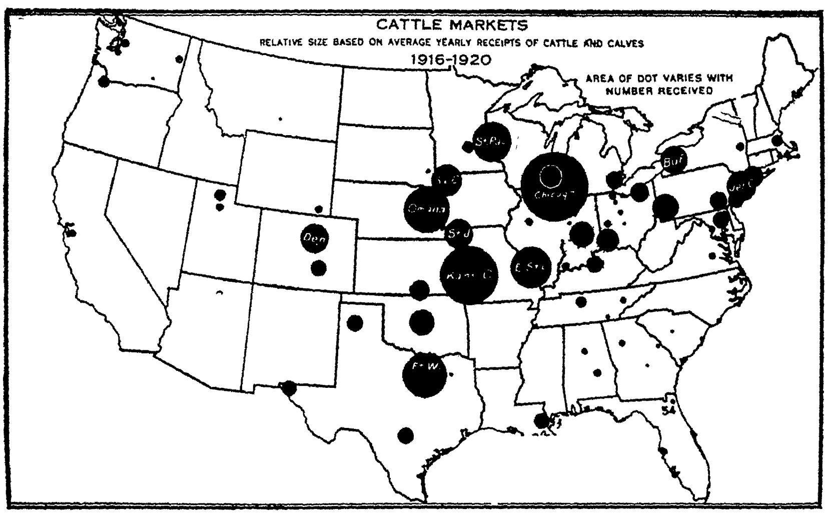


FIG. 123.

The slaughtering and meat-packing industry is localized in the Corn Belt or near its margin. The industry in New York and New Jersey is centralized chiefly in the urban area about New York City where it meets the requirements of the large Hebrew population for fresh meat.

agricultural implements. This region produces nearly two-fifths of the product-value of the country's flour, nearly a third of which comes from





Courtesy U. S. Department of Agriculture.

FIGS. 124, 125.

Nearly seven-tenths of the cattle and calves and more than three-fourths of the hogs marketed annually enter markets in or on the margin of the Corn Belt. Chicago is the leading market. East St. Louis ranks second as a hog market and Kansas City as a cattle market. (Compare with Fig. 123.)

the mills of the Lower Lake Region. The modern large merchant flour mill tends to locate at transportation centers in or near the wheat-pro-

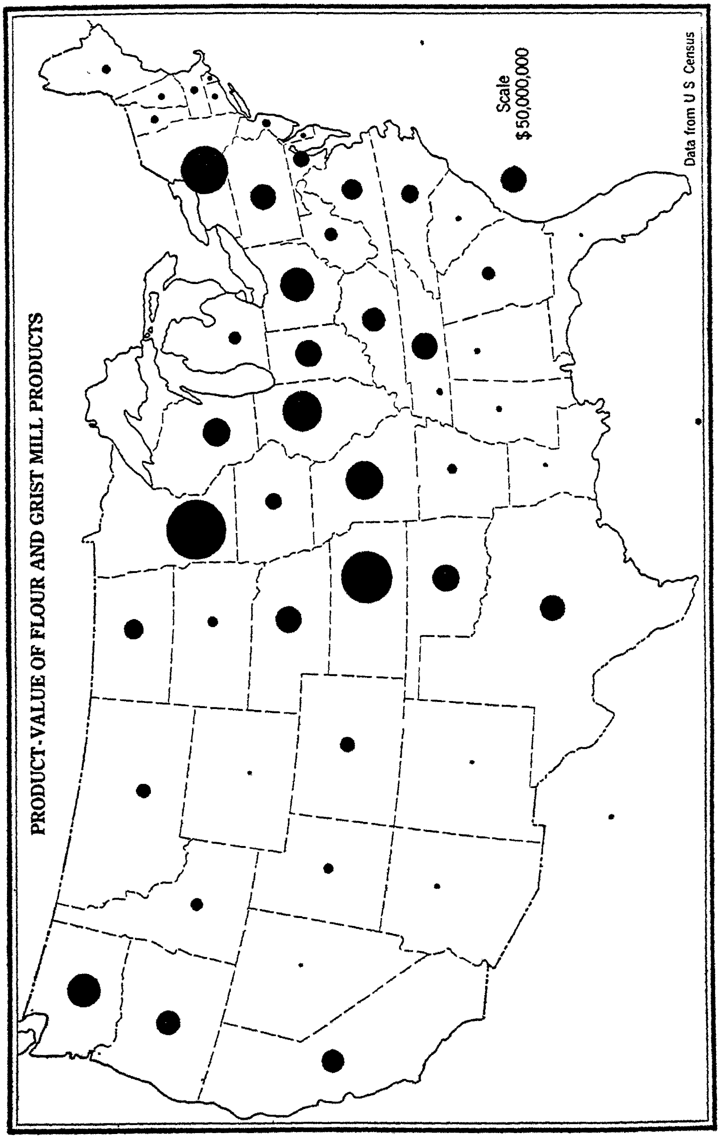


FIG. 126.

Flour milling is scattered widely throughout the United States, but the large merchant mills tend to locate at transportation centers in or near the wheat regions such as Minneapolis and Kansas City, and in or near large consuming centers having low cost transportation for wheat, such as Buffalo. More than half the product-value of the flour and grist mills of the country is contributed by Minnesota, Kansas, Missouri, Illinois, Ohio, and New York.

ducing regions or in large consuming centers having low-cost transportation for wheat. Minneapolis illustrates the first type of location and is the largest wheat market and largest flour-milling center in the world.

Its mills grind nearly a fifth of the flour (product-value) of the North Central Region and a ninth of that of the United States. Coincident with the decline of the lumber industry and the invention of the processes that make possible the production of high-grade flour from spring wheat, the industry grew up about the power supplied by St. Anthony Falls. Kansas City, St. Louis, and Wichita are other centers of this type, and Chicago and Buffalo belong to the second class where wheat may be brought by Lake at low cost and a dense population within a small radius provides a large market. The flour-milling industry in Buffalo—the concentration point at the east end of Lake Erie and on the principal route to the markets of the East and Europe—has grown rapidly, and that city now ranks second among the flour-producing centers of the country. Its location, excellent power resources from Niagara Falls and from Pennsylvania coal, and nearness to a large market may enable it to rival the "Flour City" in the future. (Fig. 126.)

Iron and Steel Industry.—Large-scale production of iron and steel started about fifty years ago and attained commanding significance within the last twenty-five or thirty years. Its use to-day is very largely a measure of the industrial importance of a nation. Modern industry demands power, especially coal, and millions of tons of steel. The evolution of the iron and steel industry in America may be divided into three quite distinct periods on the basis of the fuel used, viz., charcoal, anthracite, and coke. It is the coke period that has brought the Lake Superior Region into prominence. Previous to 1855, charcoal was dominant and furnaces were scattered widely to meet local needs, as in the case of the old sawmills and grist mills. Between 1855 and 1875 anthracite led. Since a small area in northeastern Pennsylvania had all the fuel, was able to make large quantities of iron, and was near the New York and Philadelphia markets, the first opportunity for leadership in the American iron industry was offered and the first great producing center was established there. In 1870 half of all the pig iron was made with anthracite, but by 1910 this ratio had declined to 2.4 per cent.

By 1875 the greater efficiency of bituminous coal and coke in this industry had been demonstrated. The most important supply of coal and coke lay west of the Appalachians, as did the iron ore and limestone, hence before 1880 the industry had shifted to western Pennsylvania. The introduction of the Bessemer process led to rapid development, and by 1880 the best local ores had been used. Nearness to Lake Erie and cheap Lake transportation made it impossible for the lean ores of western Pennsylvania to compete with the high-grade ores from Lake Superior, hence by 1883 western Pennsylvania produced more pig iron than any other district in the United States. Pittsburgh could not avoid

becoming an iron and steel center. It commanded Lake ores and the best of coke from nearby centers, and had good transportation facilities.

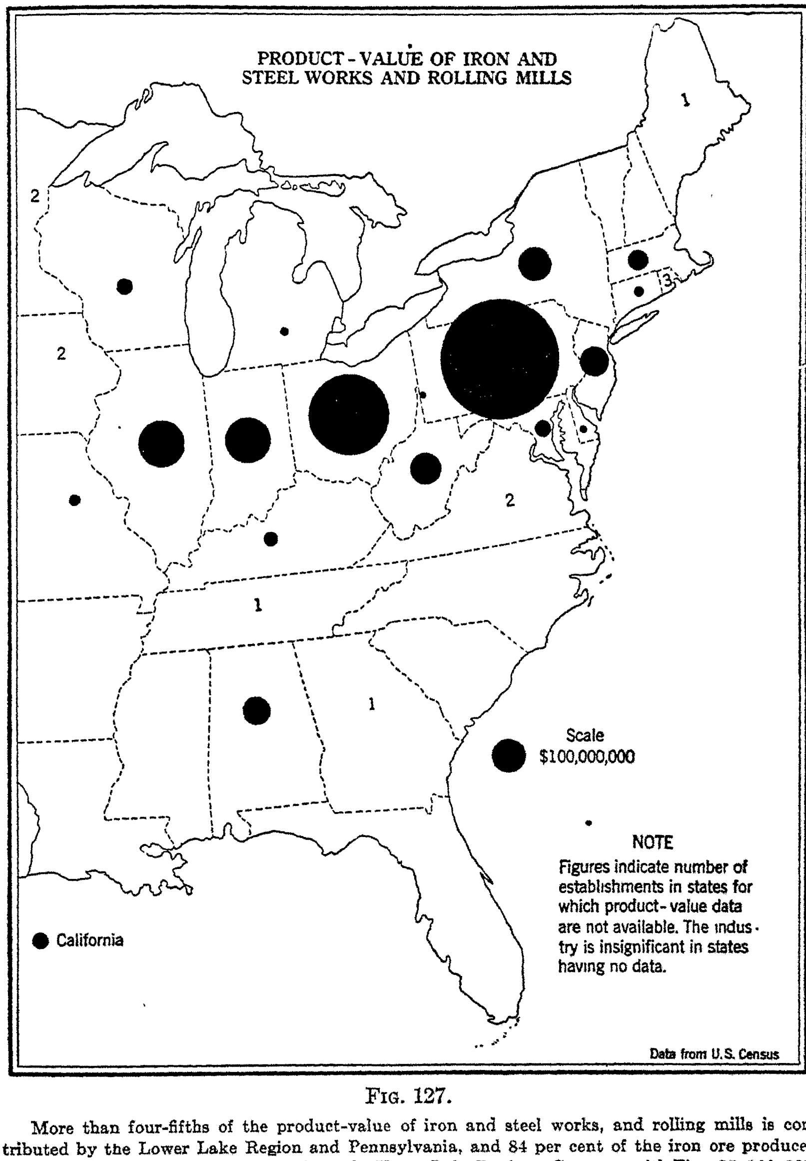


FIG. 127.

More than four-fifths of the product-value of iron and steel works, and rolling mills is contributed by the Lower Lake Region and Pennsylvania, and 84 per cent of the iron ore produced by the United States annually comes from the Upper Lake Region. Compare with Figs. 35, 120, 133.

by water and rail, natural gas, an established eastern market, a rapidly growing interior market, and a local market produced by the growth of

Courtesy Illinois Steel Co.

FIG. 128. A general view of the large steel mills at Gary, Indiana, situated on Lake Michigan, where all raw materials may be assembled and the products of the mills marketed economically.

allied industries. For more than half a century these advantages have made Pennsylvania the leading iron- and steel-making state.

Under modern practice the production of 1000 tons of pig iron from Lake Superior ore (about 55 per cent metal) requires 1800 tons of iron ore, 1000 tons of coke, and approximately 700 tons of limestone. Since an enormous quantity of heavy raw materials must be brought together in the iron and steel industry of the country, it is evident that efficient low-cost transportation is a very important factor in plant location. With development of an efficient railroad system and the conversion of coal to coke at the steel mill where the by-product gas may be used for power, the Lake shores have become focal points at which the greatest economies could be effected, and the industry is shifting in that direction. Here are such centers as Duluth, Milwaukee, Chicago, Gary, Toledo, Cleveland, Lorain, and Buffalo (Lackawanna). Other large producing mills are in the Youngstown, Ohio, district, which has about the same advantages as Pittsburgh. To-day the Lower Lake Region has nearly a third of the blast furnaces of the country, produces more than two-fifths of the pig iron, and more than a third of the product-value of blast furnaces, steel works, and rolling mills. As long as the Lake Superior district continues to be the major source of iron ore it appears likely that this region will continue to be a leading producer of

iron and steel, as it provides for the assembling of abundant low-cost fuel, power, ore and limestone, and an efficient railroad system makes accessible the markets of the Middle West and East. Abundant capital and both skilled and unskilled labor are available also.

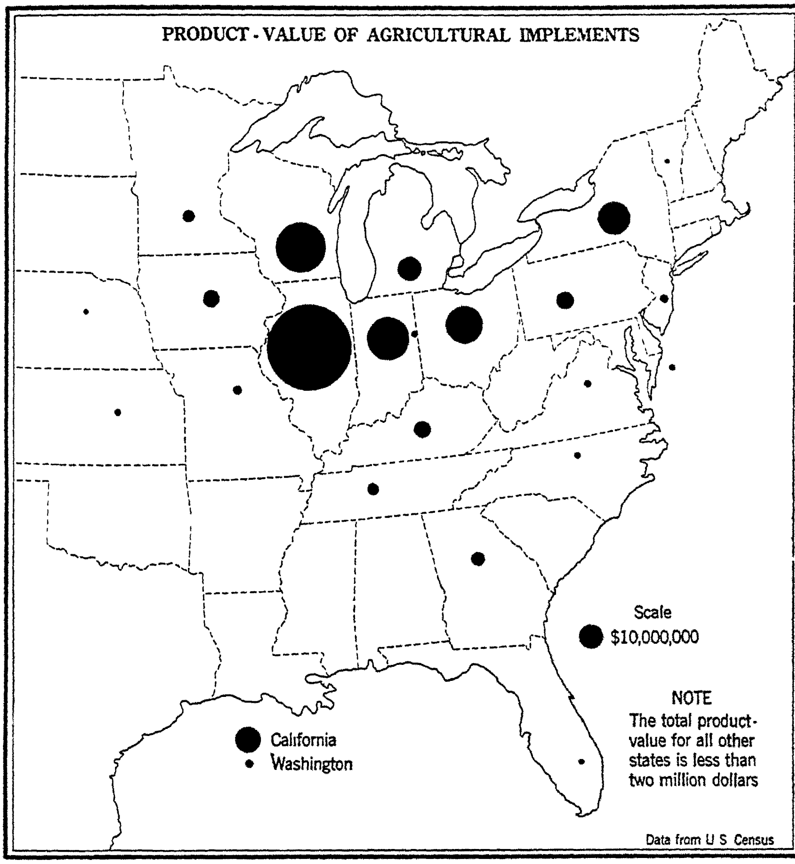


FIG. 129.

Measured by product-value, four-fifths of the agricultural implement industry is situated in the Great Lakes States, with more than two-fifths of the country's total in Illinois alone.

The iron and steel industry itself has many branches and produces a multitude of products—blast furnaces, pipe mills, and rolling mills with their plates, sheets, structural steel, railroad rails, rods, etc. To hundreds of other plants the product of the steel mill is raw material. The products of these are legion, including cars, engines, automobiles, agricultural implements, ships, and the output of the foundry and machine shop. The production of agricultural implements is confined largely to

in the United States declined from about 2,000,000 in 1910 to about 10,000 a dozen years later. In the same period the output of automobiles increased from about 80,000 to 4,000,000. The rapid rise of the automobile industry is without parallel in industrial history. In 1914 it ranked eighth in product-value among the industries of the country, but by 1919 it had risen to third place, being exceeded only by slaughtering and meat packing, and iron and steel works and mills. To-day nearly four-fifths of the product-value of automobiles made in the United States is produced in the Lower Lake Region, and more than three-fourths of the product-value of automobiles, bodies, and parts. More than half (56 per cent) comes from Michigan.

The growth of the industry in Michigan, and especially in Detroit, has been extraordinary, and its influence in turn no less so. In 1900, 39 per cent of Michigan's population was urban, and in 1920, 61 per cent. The population of the leading automobile cities of Detroit, Pontiac, and Lansing increased three and one-half times, and that of Flint seven times. In five years the product-value of Detroit's manufactures trebled, and that of its automobiles, bodies, and parts, which made up nearly 45 per cent of the total in 1919, increased three and one-half times. The industry soon spread beyond the city bounds into the suburbs. In 1920 the combined population of Hamtramck, Highland Park, and Dearborn was eleven times that of a decade earlier. However, large producing centers are not confined to Michigan. Cleveland, Toledo, Indianapolis, South Bend, and Akron—the great automobile tire center—are rivals.

The location of the industry in Detroit rather than in some other city is probably an accident. That city happened to be where it was first established on a mass-production scale. However, besides being the natural successor to the carriage and wagon industry and having the advantage of an early start, automobile manufacturing finds other favorable factors in the Lower Lake Region. This region affords cheap lake transportation for raw materials; has some hardwood and an abundance of steel and other metals; has excellent railway transportation, as the main lines from East to West pass through it; and is near the center of population, which minimizes the cost of marketing a bulky product.

INDUSTRIAL CENTERS

Cities are the Epitome of Human Endeavor.—Modern cities are the compendium of a mechanistic civilization. In pre-railroad days, town sites were determined largely by the need of transshipment at foci of natural routes. Towns grew at natural junctions of land, river, and

lake routes, at the head of navigation, at breaks in navigation, at fords, at the junction of navigable tributaries, and at points where there was a salient change in river direction. Such centers became the marts for all kinds of tributary products, and later the focal points for canals, highways and railways. The larger environmental factors, such as climate, soil, power, minerals, and regional location, continue to function, but in most cases the factor that determined the immediate location has ceased to be of great significance. Chicago would probably continue to be a great city if the Great Lakes should cease to exist. The modern city is a complex unit of closely crowded humanity, a great railroad center, a great market, a center of skilled and unskilled labor, a great collecting, distributing, and manufacturing center with large-scale business organizations having great capital investments in established plants. Many of the large railroad cities of to-day were the water-route cities of the pre-railroad period. All cities of the North Central Section having a population of 320,000 or more occupy river or Great Lakes sites. Eighty-five per cent of the total population of the 19 cities of 100,000 or more people is in the 12 cities situated on rivers or on the Great Lakes. These cities are all important railroad centers. River traffic has ceased to be of great importance, but the Lake traffic wields a large influence.

The Chicago District.—Someone has aptly described Chicago as "the epitome and climax of the prairie and Lake region." Its immediate site was determined by the Chicago River, which served as a harbor and led by a low portage through the old outlet channel of glacial Lake Chicago, to the navigable Des Plaines and Illinois rivers and thence to the Mississippi. At times of high water canoes passed from the Lake to the Des Plaines without portaging. This route was followed by the Indians long before the advent of the white man. Far more important in the growth of Chicago has been its location near the southern end of Lake Michigan where the Lake projects into a vast plains area whose continuity of fertility and productiveness is unequaled anywhere else in the world. To-day nearly every important railway east of the Appalachian Mountains enters Chicago. All the main trunk lines from East to West pass around the southern end of the Lake and have their terminals in Chicago. All railroads from the Northwest make their connections there. No railroad passes through Chicago. It has become a huge collecting, distributing, and manufacturing center. To it may be gathered all the mainfold products of the Middle West: wheat from the Dakotas and Kansas; live stock from the Corn Belt and western grazing lands; iron ore and timber from the Upper Lake Region; and coal from Illinois, Ohio, and Pennsylvania. From it may be distributed with

equal facility the products of its factories. To-day the number of people engaged in its manufacturing enterprises is greater than the total population of either New Hampshire or Vermont, and five-sixths that of industrial Rhode Island. From a city of 4400 people in 1840, it has risen to second place among the cities of the country in population and in the value of its manufactures. At the same time it has become the world's greatest grain, meat packing, and railroad center. It is a product of the machine age, like most other American cities, and its accomplishments are measured largely by materialistic standards.

Chicago's industries are large and varied and are based chiefly on raw materials of the region. The Middle West is also its principal market. The product-value of its manifold industries equals half that of Pennsylvania, and two-thirds that of Illinois. The leading ones are slaughtering and meat packing, iron and steel mills, foundry and machine shops, printing and publishing, and men's and women's clothing. The first constitutes more than a quarter (28 per cent) of the total.

The Chicago district includes Gary and Whiting, Ind., with their steel mills and petroleum refineries, and Milwaukee, Racine, and Kenosha, Wis., with their extensive leather-tanning, slaughtering and meat-packing, and agricultural-implement establishments. The industries of the whole district utilize the raw materials of the Middle West—agriculture, mine, and forest—and many products find their chief market there, e.g., farm machinery. All the principal centers produce a great variety of metal products. All have profited in the past by their location on Lake Michigan, and Gary, Milwaukee, and South Chicago depend upon it now for the delivery of Upper Lake ore. Though the Lake commerce of Chicago and Milwaukee is of considerable industrial significance to them, it is less so than formerly and is very small compared with the huge movement of commodities by rail.

The Lake Erie District.—From Detroit to Buffalo, at foci of Lake and land transportation, have grown up a number of important industrial centers. These include the automobile city of Detroit, which is discussed elsewhere, Cleveland and Toledo with their iron and steel mills and automobile plants, and several lesser ones. The manufacturing industries of the Ohio counties bordering Lake Erie are confined largely to Cleveland and Toledo where iron ore of the north meets coal from the south. The product-value of the manufacturing enterprises in these Lake-border counties constitute a third of that of the State. From the Lake shore centers, iron ore is distributed to many other Ohio iron- and steel-working cities, particularly in the Youngstown area.

River Industrial Centers.—Though river traffic is no longer of paramount importance, many river cities have continued their growth with

the development of railroad service. The largest of these is St. Louis, Mo., with East St. Louis just across the Mississippi in Illinois. St. Louis is the fourth largest city in the North Central Section in population, and correspondingly large industrially. Situated near the confluence of the Mississippi and three other navigable rivers—the Missouri, Ohio, and Illinois—it occupied a commanding position when rivers were the principal means of transport. Its strategic commercial position naturally made it a focal point for railroads as they were extended westward. It was, therefore, enabled to maintain its commanding position in the Southwest. It occupies a central position in the producing areas of corn, wheat, cattle, and hogs, and has become a marketing center for these products and a distributing point for the many commodities required by an agricultural population. Its industries are highly varied, and no one holds such a commanding position as do automobiles in Detroit or flour milling in Minneapolis. Meat packing is its leading industry, and it is the greatest boot- and shoe-manufacturing center outside of New England. Meat packing is the dominant industry of the Kansas City center and of Omaha, which, like St. Louis, are near the junction of the stock-food producing prairies and the western grazing lands. Other important meat-packing centers in the same district are St. Joseph, Mo., and Sioux City, Iowa.

Cincinnati, situated at a salient change in river direction and near the confluence of the historically important Miami and Ohio, is south of the steel-working cities of Ohio. It is tributary to the Bluegrass Region of Kentucky and productive agricultural lands at the north. In its early stage it was an important concentration point for settlers moving down the Ohio, and became a leading river port and later a railroad center. It was the leading live stock and meat-packing center until surpassed by Chicago in 1860, and that industry continues to be a leading one. Its other leading industries include machine shops, men's and women's clothing, and leather and leather goods, chiefly boots and shoes.

Minneapolis–St. Paul, the "Twin Cities," at the head of Mississippi navigation, are independent political rivals but essentially one continuous urban center. Minneapolis arose as a lumber city at the Falls of St. Anthony. With the decline of lumbering, the advance of settlers into the fertile lands of the Northwest and the production of wheat, the power of the Falls was utilized to operate great flour mills. Flour milling is now the dominant industry, measured by product-value, as that value forms 46 per cent of the city's total manufactures. But flour milling is largely an automatic process; the value of the raw material—wheat—is relatively high, and few men are needed to turn out a finished product of high value. The net value of the city's flour mills constitutes only a

fifth of the net value of its many industries, and the mills employ only 12 per cent of the total number of persons engaged in manufactures, nearly three-fifths of whom are salaried employees as distinguished from "wage earners." Its railway-car and repair shops engage two-fifths more wage earners, and its foundry and machine shops two-fifths as many. Situated on the eastern margin of the flax-growing region, with excellent railroad facilities, it has become one of the principal linseed-oil centers of the United States. St. Paul arose when the Mississippi was the great highway to the Northwest. It was then the end of the boat journey. To-day boat traffic on the great river is non-existent. St. Paul is largely a wholesale distributing center—a huge warehouse—for the Northwest. It has no outstanding industry but ranks high in many, chief among which are meat packing, leather goods (especially footwear), butter, fur goods, machine shops, railway-car and repair shops, and printing and publishing.

The industries of both cities have far outgrown the available water-power resources and coal must be brought by Lake and rail.

PROBLEMS

1. Does the Great Lakes-to-Gulf project or the Great Lakes–St. Lawrence project offer greater permanent value to the North Central States?

2. Will completion of either project named in Problem 1 materially increase the commerce of the Great Lakes?

3. Will Duluth, Chicago, or Buffalo profit most by completion of the Great Lakes–St. Lawrence project?

4. Will completion of either or both of the two Great Lakes-to-sea projects enable the North Central States to attain a higher material development than any other section of the country?

5. Will the North Central States become the leading manufacturing section of the United States?

6. Resolved: That the Lower Lake Region possesses greater advantages as a home for man than does any other equal area of North America.

7. Will the Lower Lake Region become the leading iron- and steel-manufacturing section of the United States?

8. Will agriculture or manufacturing be the leading industry in the Lower Lake Region?

9. Will Chicago maintain its position as the leading city of the North Central Section?

10. Will the Lower Lake Region ultimately have a population as dense as that of the Middle Atlantic States?

CHAPTER XI

THE UPPER LAKE REGION

A Region of Extractive Industries.—The Upper Lake Region includes northeastern Minnesota and northern Wisconsin and Michigan. Its industries are all extractive in character; it is a land of exploitation. Its long, cold winters, with heavy snowfall; short, cool growing season; abundant rain; and thin sandy or sandy loam soils have been conducive to coniferous and to mixed forest growth but unfavorable to agriculture. The ancient sedimentary and crystalline rocks have provided exceptionally rich deposits of iron and copper, and the Great Lakes have provided cheap transportation to eastern and southern markets for the products of mine and forest. As the great continental glaciers moved over the region, the less resistant rocks were gouged out and the glacial drift was distributed unequally over the land surface, forming thousands of deep lake basins, while the shallower basins thus formed became swamps and muskegs. The region probably has at least 10,000 lakes in the virgin forest and cut-over lands, many of which are being developed as summer resorts—the most recent phase of man's utilization of the natural resources.

IRON MINING

Significance of the Iron Deposits.—Iron-ore deposits situated like those of the Lake Superior district, of such high grade, in such a limited area, and so easily mined on a large scale, could not fail to affect the whole nation. Their extraction has been the chief industry of the Upper Lake Region for many years, having far exceeded forest exploitation in importance. The average yearly output of the mines is 84 per cent of the entire ore production of the United States and two-fifths of that of the world. Only one mine in the United States outside of the region produces more than a million tons annually, and the combined output of two of the mines in this region exceeds that of any other iron-mining district by more than 1,250,000 tons. The use of these ores also accounts for the growth of population in the region, the growth of numerous Lake cities, and the rapid growth of the steel industry and its many allied

industries. They have, therefore, had a profound influence upon the whole country. (Fig. 131.)

The Iron-ore Fields.—The Lake Superior ore district consists of five principal ranges: the Marquette and Menominee in Michigan; the Gogebic in Michigan and Wisconsin; and the Mesabi, Vermilion, and Cuyuna in northeastern Minnesota. The Mesabi and Vermilion are 60–90 miles northwest, and the Cuyuna about the same distance west and south of Duluth–Superior and Two Harbors, from which the ore is shipped to lower Lake ports. The Marquette Range is near the city of Marquette, the Menominee Range near Escanaba, and the Gogebic

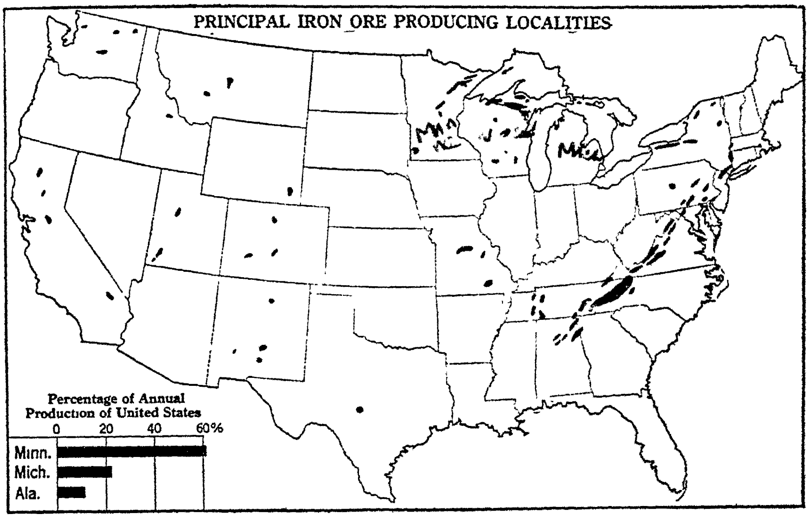


FIG. 131.

Iron in comparatively small quantities is produced in numerous localities, but about 84 per cent of our annual production comes from the mines of Minnesota, Wisconsin and Michigan in the Lake Superior district, and about 11 per cent from Alabama. Does size of area on this map bear any relation to production or to reserves?

Range 25–50 miles from Ashland. Thus each range has an adequate outlet by water, a factor of great significance in its development.

Iron ore was discovered on the Marquette Range in 1844, and the first ore was taken from the region the following year. During the succeeding eight years, efforts were made to smelt the ore with charcoal fuel, but the iron could not be marketed in competition with the steel mills of the East. In 1853 the first shipment of consequence was made to Sharon, Pa., where the first real test of the ore was made. The ore proved to be of such high grade that a demand for more was created. Progress, however, was slow for a time. The ore deposits were in an unbroken forest, 14 miles from the shore of Lake Superior, and without

Courtesy Oliver Mining Co.

FIG. 132.

The Hull-Rust-Mahoning open pit iron mine on the Mesabi Range in Minnesota. This great pit covers 600 acres, produced 11,853,000 tons in 1923, and had yielded a grand total of 131,952,000 tons at the end of the year 1926. The city of Hibbing is on the far side of the pit.

suitable means of transport; they had to be portaged around the Saint Mary's Rapids and reloaded; the Lake vessels were few and small; the ore had to be introduced into the market, and many of the iron workers were reluctant to experiment, as some had declared the ore useless. However, the opening of the Sault Canal and the demand for iron created by the Civil War resulted in a rapid increase in production. The Marquette Range had no competitor until 1877, when the first shipment of importance was made from the Menominee Range. Though the presence of other ore was known in the early 1850's, production of importance awaited transportation facilities. The Gogebic and Vermilion ranges then rose rapidly into the million-ton class.

The first ore pit in the Mesabi Range was made in 1890. Other discoveries of rich ore followed rapidly. In 1892, 29,000 tons were produced, and the next year 2,000,000 tons. (Fig. 132.) Since then the

production of the Mesabi Range has been phenomenal. From it has come 57 per cent of all the ore ever mined in the Lake Region. In a single year the output has exceeded 40,000,000 tons, and its yearly average is far greater than that of any foreign country. It continues to produce 58 per cent of the annual output of the United States; 68 per cent of that of the Lake Superior District; and 27 per cent of the world's annual production. The annual output from seven of its mines is greater than that of any foreign country except France. The Mesabi iron deposits are covered thickly with glacial drift, but when this has been removed great ore bodies of large horizontal extent, compared with their thickness, are exposed. This ore is a soft, porous, brown, red or blue hematite of high grade, and varies from a finely powdered to a compact mass. These conditions make possible low-cost, open-pit mining with steam and electric shovels, as the ore is loaded directly on to the railroad car in the mine. Estimates of merchantable ore reserves exceed 1,250,000,000 tons, and more than thirty times that amount for ores not available under present market conditions. The Mesabi has become of paramount importance in the country's iron and steel industry and the world's greatest iron producer, for a number of reasons: (1) The ore is of high quality. Until comparatively recent years, most steel was made by the Bessemer process, which demands high-grade, non-phosphorous ores. Much Lake Superior ore met these conditions and, once on the market, the demand for it grew rapidly. (2) Cheap mining methods are possible in most places. The character of the deposits made possible open-pit, steam- and electric-shovel mining on the Mesabi and comparatively cheap mining on some of the other ranges. The low cost of mining on the Mesabi is probably not equaled anywhere else in the world. (3) Transportation methods by water and rail and mechanical devices for handling the cargoes have been so improved that the handicap of distance between the coke and ore has been nearly overcome. (4) The commercial and industrial development of the country has created an unprecedented market for iron and steel products. (5) The concentration of industries under the management of large corporations has made possible the expenditure of great sums in perfecting methods of mining, transportation, manufacture, and in the elimination of waste.

The iron-ore reserves of the Upper Lake Region are large, though about 1,250,000,000 tons have been removed. The reserves available under present market conditions are estimated to be more than 1,500,000,000 tons, an amount sufficient for about thirty-five years if the present rate of production could be maintained. The low-grade reserves —similar to many ores used in Europe—are enormous, and if they can compete with the low-grade ores of the East the industry can survive

for many generations. Otherwise much of the mining region will probably revert to forest. Competition promises to be difficult, as the agriculturally controlled legislature of Minnesota tends to place an increasing tax burden upon iron ore, in addition to other local taxes. It is said that the total 1924 taxes were "nearly 30 per cent of the value of the ore at the mine."[1]

Iron Ore and Great Lakes Commerce.—As late as 1845, Lake Superior commerce was largely in furs and one horse hauled all the freight that passed around St. Mary's Rapids. The ground scarcely had been broken for copper and iron mining. When the Sault Canal was opened ten years later the traffic amounted to 14,500 tons a year. The growth of commerce was rapid, and the canal was enlarged several times in succeeding years. Nearly 90,000,000 tons of freight now pass through the Canal annually, more than two-thirds of which is iron ore, while a fifth is coal carried in returning ore boats to supply the Northwest. The east-bound ore and the west-bound coal constitute nearly 85 per cent of the traffic. Since these two commodities form most of the Great Lakes commerce, it is evident that the commercial prestige of the Great Lakes depends upon the northern iron mines. The water route, steel vessels of great capacity, cheap fuel, coal as a return cargo, the Sault Canal, river and harbor improvements, the growing demand for ore, consolidation of management, and the extensive use of modern machinery, all have contributed toward producing the lowest freight rates in the world for similar service. (Figs. 133, 134.)

Development of City Centers.—Iron mining has wielded a strong influence in the growth of three classes of city centers, viz., the mining, shipping, and receiving centers. A cluster of houses and stores soon followed the opening of mines, and upon the latter the prosperity of the village depended. To this group belong such places as Hibbing, Virginia, Eveleth, Ironwood, Iron Mountain, and Ishpeming. Virginia also has large lumber mills. To the ore-shipping group belong Duluth–Superior, Two Harbors, Ashland, Marquette, and Escanaba; and to the receiving class, such centers as Chicago–Gary, Detroit, Cleveland, Toledo, Lorain, Buffalo, and many others. Since nearly all the ore mined leaves the Upper Lake Region, the influence of iron and steel manufacturing is felt only indirectly.

The growth of the shipping and receiving cities is in striking contrast. The first are distinctly the *transfer* type, and the goods pass on to some other center for fabrication or distribution. The second are distinctly *distributing* and *manufacturing* centers and have far surpassed the others in size. Duluth–Superior would have considerable importance without

[1] Mineral Resources, 1924, Pt. I, p. 298.

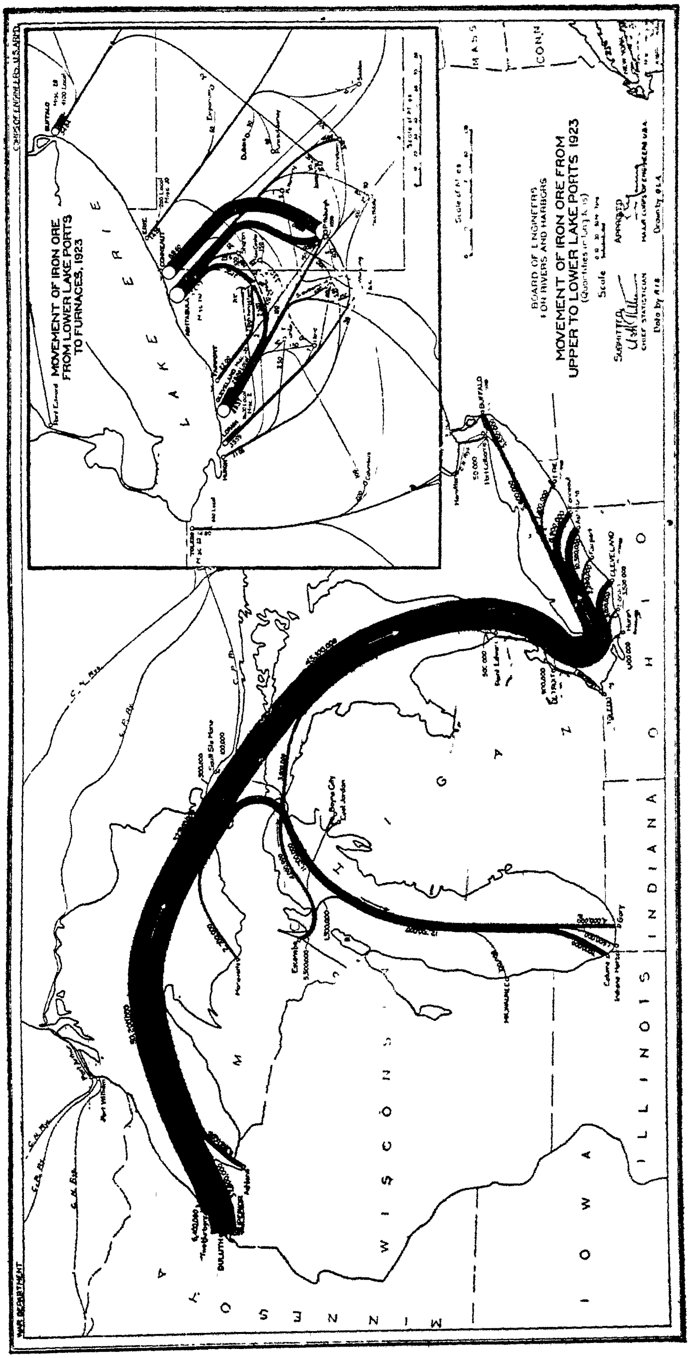


FIG. 133

More than four-fifths of the iron ore shipped from mines in the United States in 1923 moved by water from the Lake Superior district to Lower Lake ports. Three-fourths entered Lake Erie ports for local use or distribution to inland centers, more than a third going to Pittsburgh alone.

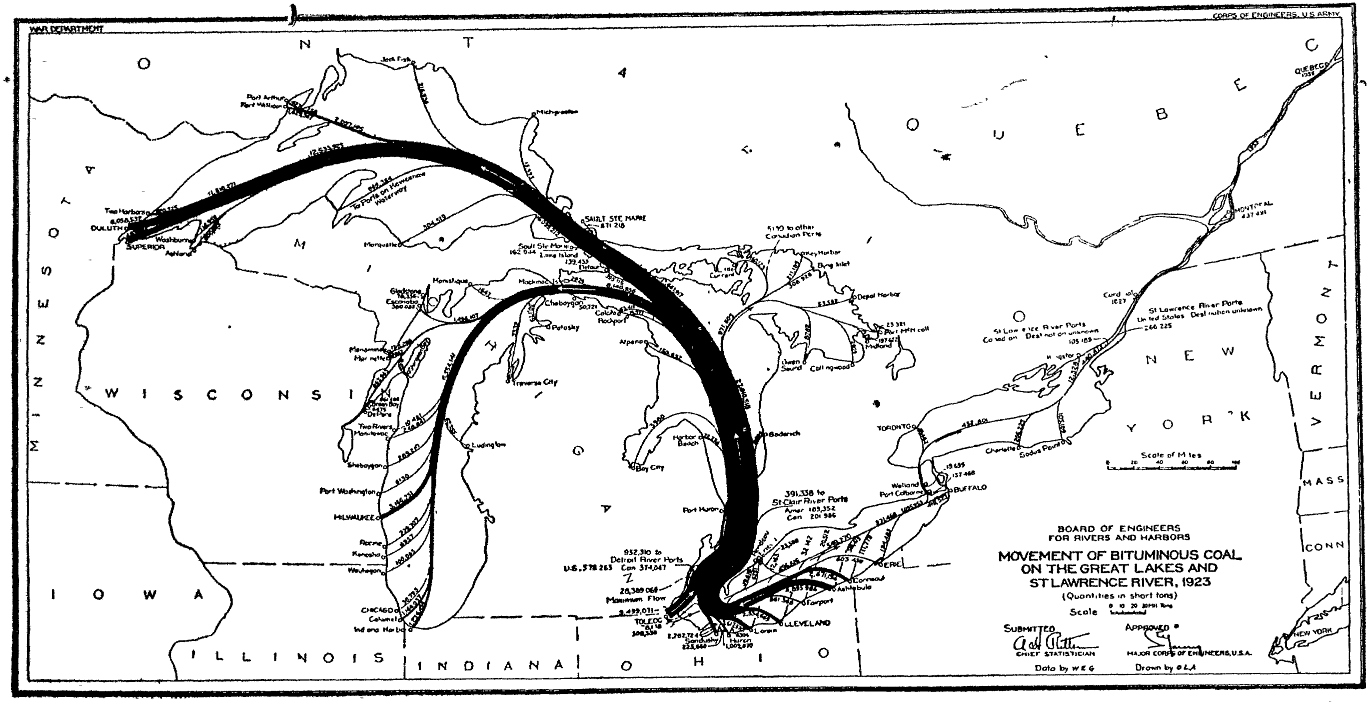


FIG. 134.

Iron ore, coal, and grain comprise most of the Lake commerce. Northern Michigan, Wisconsin, Minnesota and points farther in the Northwest obtain their coal supply by way of the Great Lakes—chiefly by returning ore boats. This great waterway makes possible the movement of coal from Pittsburgh to Duluth by rail and vessel at a total transportation and handling cost of $2.84 per ton compared with an all-rail rate from Illinois and Kentucky fields of $3.65 to $4.30 respectively. The Lakes also carry more than 3,000,000 tons of anthracite, 56 per cent of which goes to Lake Michigan ports and the remainder to ports on Lake Superior.

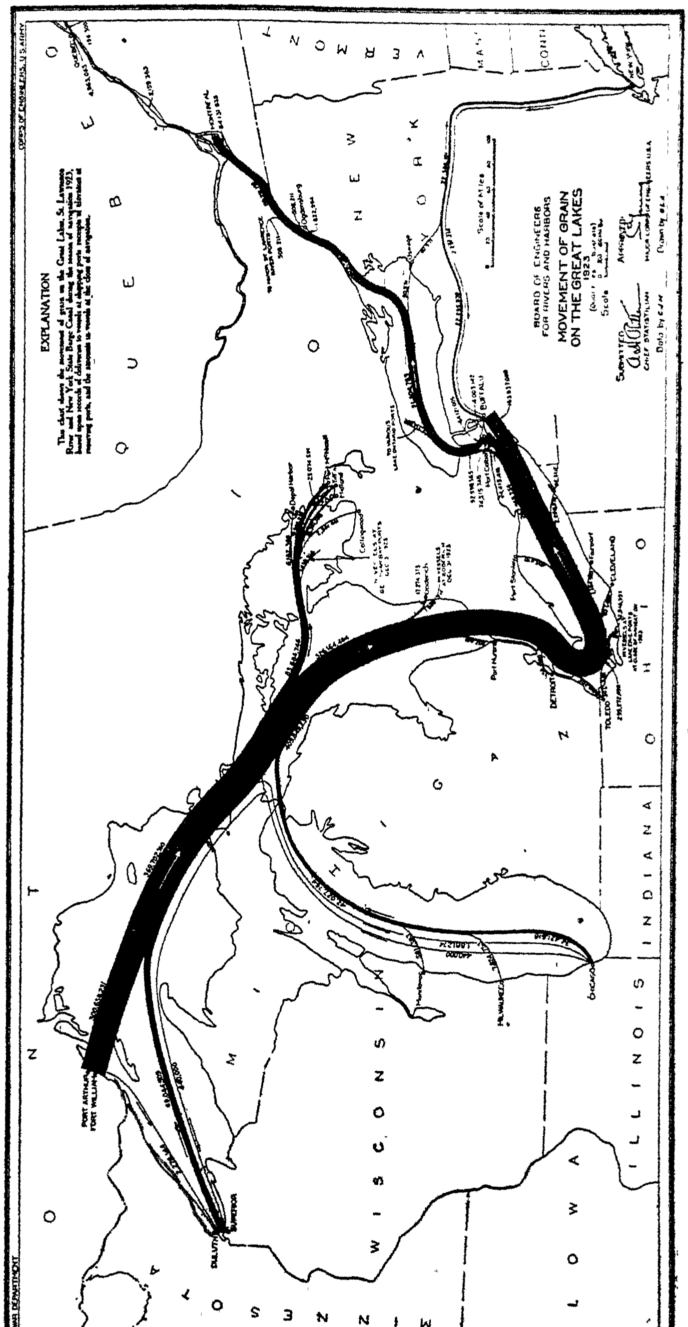


FIG. 135.

Three-fourths of the grain traffic of the Great Lakes originates in Canada at Port Arthur–Fort William. Only about one-fifth reaches Montreal by an all-water route and more than half enters Lower Lake United States ports for domestic milling or export.

the iron mines. It leads all the other Upper Lake cities in its growth, diversified interests, and possibilities, because of its (1) strategic position at the head of Lake Superior, (2) commodious, landlocked harbor of 360 acres, (3) water power from Saint Louis Falls, (4) cheap coal by returning ore boats, (5) abundance of iron ore, (6) rich though distant agricultural hinterland, (7) and an increasing market to the south, west, and northwest. Duluth now has the only steel mill of importance north of the Lower Lake Region, but nearly all other industries are based on things other than iron and steel. Although the lumber, grain, and flour-milling industries have been of much importance, the influence of the iron mines has been even greater. The development of allied iron and steel industries is yet to come, with further development of the northwestern hinterland.

COPPER

Pure metallic copper occurs in the Keweenaw Peninsula of Michigan and was worked by the Indians before the advent of the white man. Mining by the white man began in the 1840's, and for many years Michigan was the leading copper-producing state. Though huge quantities of copper have been taken from the mines and though it is now more than a mile from the entrance of some of the mines to the farthest workings, the output has increased in recent years and Michigan ranks fourth as a copper producer. The ore is now reduced, and the copper made ready for commercial use, near the mines. Like iron, copper is converted into its many industrial uses in other parts of the country and hence contributes little to the development of this region, except in the mining and local concentration processes. (Fig. 136.)

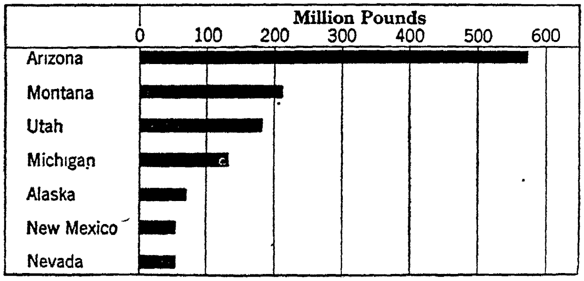


FIG. 136.—Leading States in Copper Production. Average, 1922–1924.

Michigan, with rich deposits of pure metal, was formerly the leading copper producing state. Arizona now produces 36.1 per cent., and Michigan 8.5 per cent of the annual output of the United States. The four leading states produce 69.7 per cent.

FORESTS

This region was originally forest-covered, with such valuable trees as the white pine, hemlock, spruce, fir, beech, and maple. Abundant rainfall and cool summers produced a splendid growth. The heavy winter snows and the ice-covered rivers and lakes favored exploitation when the lumberman had exhausted the easily accessible forests of New England and moved westward. The Michigan forests were the first to be attacked, and Michigan led in production for a number of years, followed in turn by Wisconsin and Minnesota. The lumberman then

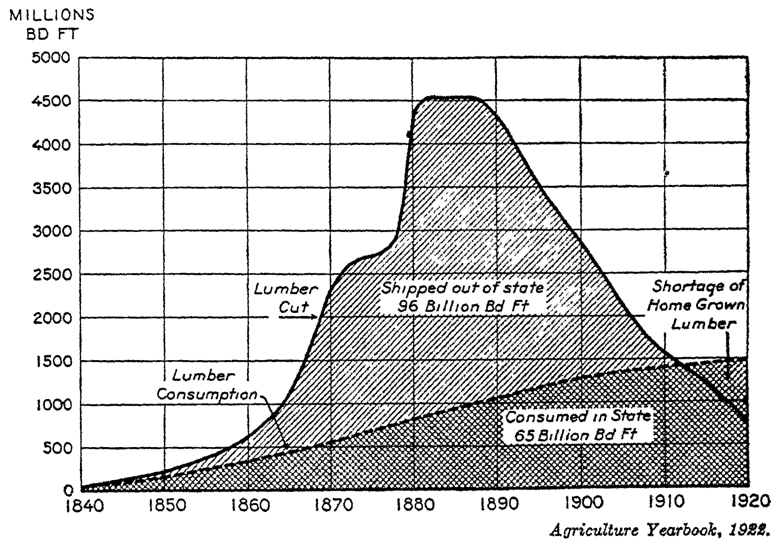


FIG. 137.—Michigan's Lumber Cut and Consumption.

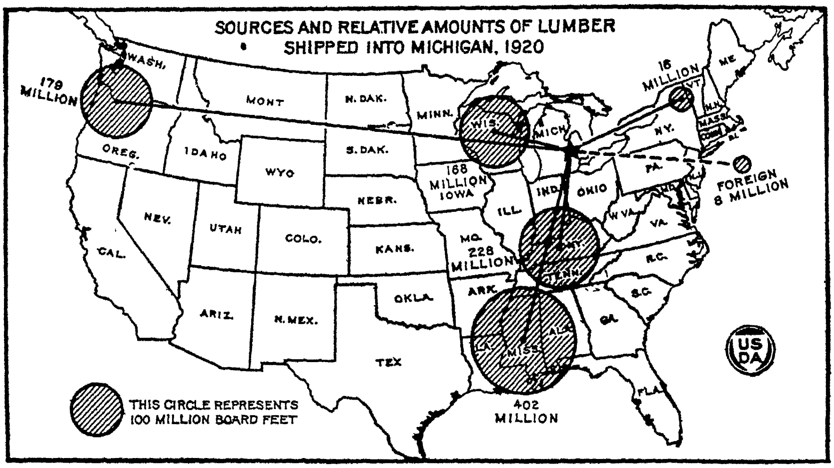
Michigan was once a leading lumber producing state but it can no longer supply its own needs. Thousands of acres once covered with splendid forests now present a scene of desolation, the result of ruthless exploitation of a rich natural resource. To-day Michigan's annual freight bill on imported lumber very probably exceeds $15,000,000, and the State is typical of the entire Lake Region. (See Fig. 138 for sources of lumber and Fig. 180 for rise and decline of industry.)

moved on to the forests of the South and is now attacking those of the Pacific Coast. To-day only a small fraction of the magnificent stand of original forest remains in the Upper Lake Region. A few large mills are still operating, and lumbering and pulp making are still leading industries, but the quality of many of the logs being sawed is far below that of former years. Traveling across the district, one is confronted by mile upon mile of cut-over and burned-over forest lands, with here and there a clearing where some hardy pioneer is endeavoring to make a living by

agriculture. One must now penetrate areas remote from transportation routes to find an undisturbed virgin stand of any considerable size. (Figs. 137, 138.)

AGRICULTURE

Some of the cut-over land is suited to agriculture, and probably 40,000,000 acres in the Lake States as a whole is best adapted to forest growth. Properly planted and protected from fire, this acreage can be made to produce an annual tree crop of great value. It seems probable



Agriculture Yearbook, 1922.

FIG. 138.

The forests of Michigan are now so depleted that it imports more than a billion board feet of lumber annually. Nearly three-fifths is secured by a long haul from the far South and far Northwest.

that, with the exhaustion of the iron and copper, a forest growth with agriculture interspersed on the more fertile areas, supplemented by work in the lumber camps during the winter months and the expansion of the summer-resort business on its many lakes, will be the future of the Upper Lake Region. With such agriculture can go live stock and the dairy industry. At present agriculture depends chiefly upon the mining centers for a market. These will continue to be the market for some years, but ultimately the agricultural products must be in a form to stand the cost of transportation to more distant consuming centers.

PROBLEMS

1. Resolved: That the Upper Lake Region offers greater opportunities as a home for man than do any two countries of northern Europe.

2. Can the Upper Lake Region maintain a population as large as either Norway or Sweden and on an equally high standard of living?

3. Will exhaustion of the high-grade iron ore of the Lake Superior Region result in a transfer of the iron-mining industry to the East and South?

4. Is expansion of industrial development in the Northwest dependent upon maintenance of the relative importance of iron mining in the Upper Lake Region?

5. Describe the Upper Lake Region as it is likely to appear a hundred years from now.

6. Will agriculture and forest industries become the leading industries of the Upper Lake Region?

7. Should essentially all the Upper Lake Region be devoted to the production of a forest crop?

8. Can the Upper Lake Region develop a dairy industry comparable to that of southern Wisconsin?

CHAPTER XII

UNIT AREAS IN THE NORTH CENTRAL SECTION

STUDIES of several small unit areas, even though such studies are in the nature of an "overview," aid in amplifying the more generalized treatment of the North Central Region presented in the preceding pages. Since a brief discussion of any large region must be on broad lines, many details that show the intimate relation of man to his environment are necessarily omitted. However, it is the sum of these detailed relationships that characterize the whole. Numerous reasons may determine the selection of such unit areas for study, e.g., because they are representative of a much larger area, because they represent the highest type of all-round development, because they typify the growth of a selected industry, because they represent the evolution of an urban or a rural community, etc. The unit areas discussed in the following pages have been selected from widely separated parts of the North Central Section as representative of (1) rural and (2) rural-urban communities in which one or more phases of human interests predominate. However, none of these areas possesses outstanding leadership in any particular field of human endeavor. In this respect each is typical rather than exceptional.

A RURAL-URBAN AREA IN OHIO

From among the many areas that might be selected as typifying the eastern portion of the North Central States, Marion County, Ohio, has been chosen as representative. The county lies near the eastern margin of the Corn Belt, just northwest of the center of Ohio and about 45 miles from Columbus. Its surface features are strikingly uniform—with an elevation range of only 200 feet—as it occupies a part of the broad, smooth to gently undulating glacial plain that forms the divide between the Ohio and Great Lakes drainage basins. The local elevation differences are due to stream erosion, but the slopes are sufficiently gentle to be used for agricultural purposes and very few are steep enough to erode seriously. Nearly nine-tenths of the entire area is mantled with fertile, silty clay-loam derived from the glacial drift.

The climate is healthful, invigorating, and favorable to crop production. The mean summer temperature is 72°, and the growing season averages 152 days in length. Nearly three-fifths of the annual rainfall of 38.5 inches comes during the spring and summer months, and a winter snowfall of 26.5 inches usually provides ample protection to winter wheat.

The first immigrants came from Virginia, Pennsylvania, New York, Kentucky, and New England, and were largely English, with some of Dutch, Irish, and German ancestry. These first settlers made their homes in the southern part of the area in 1806–15, and by 1821 the population had grown sufficiently to organize the county. In 1919 the area had a population of 42,000, three-fourths of which lived in the city of Marion and seven small rural villages. The present farm population averages 26 to the square mile, even though it decreased 19 per cent during the last two census decades. During the same period the population of Marion (city) increased 135 per cent. To-day the area has the appearance of a mature and thriving community with its farm homes and other buildings well built and well cared for. Many homes are equipped with modern conveniences, such as water, electric lights, and telephones. More than nine-tenths of the land area of the county is in farms, and only a tenth is woodland and other unimproved farm land. The average value of farm property is $22,000 per farm, and more than three-fifths of the farms are operated by owners. Highly developed means of transportation are available, as railroads traverse all parts of the area, most of the 600 miles of highways maintained by the county are hard-surfaced, and all the State highways in the county are paved. Educational facilities are excellent. All of the rural townships, except one, maintain centralized schools which are housed in modern brick buildings.

Agriculture

The higher lands, which were originally covered by virgin hardwood forests, were the first to be cleared and cultivated. Not until later years were the lower, treeless and swampy lands reclaimed and farmed. The early farm products were much the same as are produced to-day, except that the area devoted to each has changed relatively. Shipments from Marion (city) in the 1850's included wheat, corn, oats, clover seed, wool, cattle, hogs, sheep, horses, and hay. Since then the relative acreage of corn and oats has increased, and the wheat acreage has decreased proportionally. Present-day agriculture consists of general farming combined with stock feeding. Wheat and oats are the principal money crops. Corn, hay and forage crops, wheat, and oats are now the four leading

crops. Each of the first two occupy a quarter of the improved farm land, and about 13 per cent is devoted to winter wheat, and 12 per cent to oats. Though numerous other crops are grown, they occupy a very minor position as more than three-fourths of the improved land produces the four leading crops. Potatoes, small fruits, and orchard fruits are raised chiefly for home consumption, but with a small surplus for local markets. (Fig. 139.)

The corn and hay crops are converted into cash through the medium of stock feeding on the farms. In 1919 there were 53,200 hogs, 7700 beef cattle, 11,400 dairy cattle, and 38,700 sheep in the county. Most of the beef cattle and sheep are feeders shipped from western parts of the country to be fattened for the market. They are usually imported early in the season, and kept on the pastures through the summers. In the fall the cattle are turned into the unhusked corn fields or are fed shelled corn and other fattening foods, while the sheep are placed in the stubble fields from which the wheat has been harvested, or in the corn fields. Both animals are later put in prime condition by more intensive feeding. The hogs are raised in the area, pastured during the summer, and fattened chiefly on corn in the fall and winter. The fattened stock is shipped to market in Marion, Columbus, Pittsburgh, Cleveland, Buffalo, and Chicago.

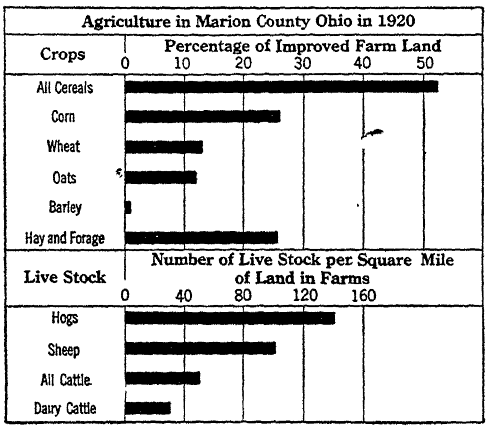


FIG. 139.

More than half the improved farm land of Marion County produces cereals. Corn and hay and forage occupy about equal acreage. More than half the improved farm land is devoted to these two crops.

The agricultural industries of Marion County are conducted on what is commonly called the "extensive-pasture scale," with a minimum of soiling to supply additional feed. This is in striking contrast with the great stock-producing areas of Iowa, Kansas, and Nebraska. Most of the feeding is done in the open, and there are comparatively few covered feeding grounds or sheds. Dairying is of local importance, especially around the city of Marion and about some of the villages where creameries have been established.

Urban Centers and Manufacturing

Marion, located near the center of the area, is the leading city, and its population of 27,800 comprises two-thirds of the county's total population. Each of the seven other municipalities had a population of less than a thousand in 1919. Marion has superior transportation facilities, as many railroads and many hard-surfaced and paved highways radiate from it in all directions, giving access to all the principal markets of the country. It is a prosperous manufacturing city whose major industrial plants produce steam shovels, road rollers, engines, threshing machinery, conveyors, alloy steel, brass and malleable castings, steel bodies for automobile trucks, and iron and steel beams. Among other important products and industries are rubber tires, lime, silk mills, meat packing, flour mills, and woodworking. Its factories employ more than 4800 people, and the yearly value of their products is nearly three times greater than the total value of all crops produced in the county. The city affords a good market for a large, easily accessible territory, and adjacent farm land has considerably higher value than the average for the county which was $127 per acre in 1919.

IN THE IOWA CORN BELT

Adair County, situated about 50 miles southwest of Des Moines and 75 miles east of Omaha and Council Bluffs, may be taken as a typical agricultural area in the Iowa portion of the Corn Belt. It lies on the watershed between the Missouri and the Des Moines rivers. This watershed extends from the northwest corner of the County to its center, where it bears eastward, and where a branch divide extends southward. Numerous small ridges radiate from these principal divides, but as a whole the surface is gently rolling with broken belts along the numerous streams which reach practically all parts of the area. No marshes, ponds, or lakes worth mentioning exist. The "rougher" lands occur in the southwestern and southeastern parts, but the range in elevation for the county is very small, being less than 250 feet, and the extensive development of highways on the sectional plan divides it into a nearly uniform checkerboard pattern. Nearly all the soil is of glacial origin but modified by wind, streams, and other weathering agencies. Over the more elevated surfaces rests a mantle of loess, and, on the lowland, alluvial soils representing wash from the uplands.

The climate is characterized by long, warm summers and moderately cold winters, with extremes rarely prolonged sufficiently to injure

crops or live stock seriously. Temperatures for the three summer months average 72°, and for the three winter months 22°. With a growing season of 165 days; an average annual rainfall of 33 inches, seven-tenths of which comes in the spring and summer months; with rich soils on a land of low relief; and with good transportation facilities to markets, the area presents conditions highly favorable to agricultural development.

The first settler arrived in 1849. Other settlers soon followed in rapidly increasing numbers, and the county was organized in 1851. Most of the early immigrants came from eastern states, and 95 per cent of the present inhabitants are native-born. There are a few hundred of German and Scandinavian origin. The population is wholly rural, as there are only seven small villages, the largest of which is Greenfield with a population of 1700 and located near the center of the county. The farm population averages about 16 to the square mile, and the total population, including the villages, averages 25. As in many other rural districts, the population decreased during the last two census decades, the loss amounting to 12 per cent. To-day the county's 573 square miles of gently undulating surface, covered by dark brown to black fertile loam soils, presents a panorama of well-kept farm homes and other buildings, and well-tilled fields enclosed by mile upon mile of barbed-wire fence modified in part by woven-wire bases where required to confine the thousands of swine that are raised annually and fattened upon the chief crop—corn. Practically the only areas not cultivated are the more broken sections which are kept in permanent pasture, and farm woodlots. The woodlands and the other unimproved lands in farms constitute only 7 per cent of the entire area of the county. Telephones and rural mail service reach all parts of the area, and modern farm machinery and other equipment are in common use.

Agriculture

Farming has been the dominant industry since the arrival of the first settler and is likely to remain so. In the early days the live stock was herded on the open range, often by contract, and only the cultivated fields were fenced. As the population increased the fenced areas came to occupy an ever-increasing proportion of the land area, and the open ranges were largely taken up by the late seventies and early eighties. Flax was used frequently as a breaking crop in the early days, but its growth was practically discontinued in the decade following 1900. The original type of agriculture—live stock and general field crops—has continued to increase in importance. This type has as its basis the raising

of live stock, especially hogs and beef cattle, and to a smaller extent sheep, horses, and mules, and the production of food crops chiefly to support the animal industries. Some grain, principally wheat and corn, is marketed. Oats, barley, rye, sorghum, Kafir, millet, sudan grass, timothy, clover, alfalfa, and prairie grass comprise essentially all the crops utilized for animal sustenance. (Fig. 140.)

More than half (54 per cent) of the improved land is devoted to the production of cereals. Corn is the chief crop and occupies nearly 32 per cent of the improved farm land. Even though corn may be grown on the same land for several years in succession, the average yield is about 40 bushels per acre. Corn lands are commonly plowed in the fall if time is then available, but much of the acreage is not prepared for the crop until spring. The planting is done during the first half of May with automatic planters, and the corn is cultivated three or four times during the season. The matured ears are "snapped" from the stalks in the fall and stored in cribs for feeding. Some corn is now cut by machinery for silage or for fodder-feeding during the winter.

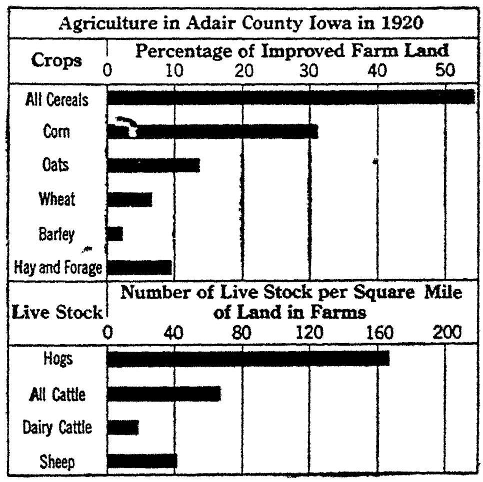


FIG. 140.

Most crops of Adair County are produced for stock food. Corn acreage is more than twice that of any other crop, yet corn occupies less than a third of the improved farm land.

Oats rank next to corn, with nearly 14 per cent of the improved land devoted to their culture, and are produced chiefly as food for work stock but to some extent for other animals. Only occasionally is there a surplus for market. They are sown in the latter part of March if the season is favorable, but more commonly during the first half of April, and are thus "out of the way" before corn-planting time.

Hay and forage crops are produced in considerable variety, nearly 10 per cent of the improved land being devoted to them. Practically the entire production is fed on the farms of the county. Nearly 3500 acres still produce wild prairie grasses yielding about $1\frac{1}{2}$ tons of hay per acre.

Wheat is not considered a profitable crop under normal conditions.

In 1909 it was grown on only 3600 acres, but the War demands for more wheat resulted in increasing the acreage to 20,200 in 1919, the last year for which official figures are available. Most of the wheat is of the winter variety and is sown in the latter part of September. The spring variety is sown about the same time as oats. Nearly all the threshing is done from the shock in the field, but some wheat is stacked to be threshed later.

Barley ranks next to wheat in acreage, and is used primarily as stock food. Potatoes for family use are grown in small patches on most farms. Nearly every farm maintains an apple orchard, and there are some peach, plum, pear, and cherry trees, and various small berry fruits to supply the home needs.

Live Stock

Hogs, cattle, and sheep are the principal animals raised. There were more than 90,000 hogs, 45,000 cattle, and 22,000 sheep on the farms of the county when the 1919 Census was taken. This was an average of more than 290 animals to the square mile of farm land. Poultry—chiefly chickens—is also produced on all farms, and the surplus products are disposed of in local markets. The value of all farm animals equals two-thirds as much as the total value of all crops produced annually. Practically every farmer raises and fattens hogs, and the average farmer markets from 50 to 60 a year. Many of the hogs produced are pure-bred or very high-grade stock.

Cattle are nearly all of the beef type, and this type has about the same monetary value as hogs. Most of the cattle are raised locally, but some feeders are imported for fattening. The herds range in size from 25 to 30 on a quarter-section farm to 100 or more on larger tracts, and only a few herds are pure-bred stock. Dairy cattle are only a fourth as numerous as the beef type, and dairying is only an incidental farm industry. The cream is separated on the farm and sold to creameries, such as the coöperative creamery at Greenfield from which the butter is shipped to the New York market.

Sheep are of much less importance than cattle or hogs and are raised more generally in the rougher lands of the southeastern and western parts of the county. Markets for cattle, hogs, sheep, and other live stock are readily accessible at Omaha, St. Joseph, Kansas City, Des Moines, and Chicago.

Adair County is a typical agricultural area specializing in meat-producing live stock, and stock-food crops. Nearly 95 per cent of its total area is in farms, and more than 87 per cent of the total area is

improved. Its farms average 164 acres in size, and, inclusive of all other farm property, had an average value of $38,750 in 1919. In that year the average farm had only 12 acres of unimproved land and an average value of $187 an acre. More than half its farms are operated by owners.

A LAKE REGION UNIT

In the broad transition zone between the undeveloped northern part and the highly developed southern part of the Great Lakes Region, are numerous unit areas that typify the evolution of the Lake country as the home of man. From among these areas, Outagamie County, Wis., which lies south and west of Green Bay and north of Lake Winnebago, has been selected. Historically, it is one of the oldest traversed sections of Wisconsin, as its principal river, the Fox, was followed by Indians and early explorers in passing from Lake Michigan to the Wisconsin and Mississippi rivers. Only fifty-one years after the Pilgrim Fathers landed at Plymouth, Père Allouez founded a mission at Depere where the first rapids of the Fox are encountered in the ascent from Green Bay. The first white settler in Outagamie County located near the present city of Kaukauna about 1790, the year after Washington became our first President. In 1843 a colony of Dutch immigrants settled at Little Chute, and the first homes were built in Appleton the same year. Fur trading was the chief occupation until about 1840, but soon thereafter began the rapid removal of the pine and hardwood forests and the expansion of agriculture and other industries. The Fox, improved by canals and locks, continued to be the principal means of transportation until the arrival of the railroads about 1860. To-day the splendid forests of pine, maple, beech, oak, hemlock, and ash are gone; more than four-fifths of the land is in farms; the farm population averages 33 to the square mile; fine, modern farm homes dot the landscape; more than 200 manufacturing establishments are in operation; and many miles of railroads, and hard-surfaced and paved highways give adequate avenues of transport. As imagination takes one back to the wilderness days of the hardy fur trader, explorer, and intrepid missionary, the change seems remarkable, yet the evolutionary process has required more than two and one-half centuries since that first Mission was established on the Fox. At first a land of exploitation, this area has become a land of permanent homes and has attained a substantial basis of human economy in comparatively recent years. It may be described aptly as old, yet new, as its substantial development represents a comparatively recent stage in man's northward migration.

Surface and Soils

The area is typical of a glaciated region as it lies within that part of Wisconsin covered by the Green Bay Lobe of the continental ice sheet. About two-thirds of the county, comprising the central, southern, and eastern parts, is covered by glacial drift. Its rolling surface consists of low hills and shallow basins distributed without definite relation to drainage lines. Many of the low, marshy basins have been drained artificially. Numerous nearly level areas that lie somewhat below the general level of the surrounding land have soils of lacustrine or outwash origin. Along the Wolf, Shioc, and Embarrass rivers in the northwest, is an extensive belt of gently undulating to nearly level alluvial soils and large areas of poorly drained peat marshes. These sluggish, meandering streams overflow large areas bordering their channels.

More than four-fifths of the county is covered by loam soils which vary from fine sandy loam to clay-loam. Considerable areas in the Fox River Valley have red clay soils which were deposited in the quiet waters of Lake Michigan when it stood at a higher level. The extensive belt of glacial and lacustrine soils, which extends across the central portion of the county from northeast to southwest and embraces the greater part of it, has a red clay subsoil which acts as a retainer of soil moisture. This belt produces all the common crops and supports many fine farms.

The numerous streams all find their way directly or indirectly into Lake Michigan. The historic Fox crosses the southeastern corner of the county in its course from Lake Winnebago to Green Bay. It flows in a gorge 50–60 feet deep between banks of red clay and can be dammed without flooding adjacent farm lands. Lake Winnebago acts as a natural reservoir regulating the flow of the river so that it is affected but slightly by drought or by heavy rains. Within a distance of 9 miles the Fox has a fall of 134 feet and five rapids, each of which has determined the location of an urban manufacturing center, the leading ones being Appleton and Kaukauna. These rapids, together with three others in the Lower Fox, constitute one of the best water-power units in the State. The water power is now well developed and it has been a very important factor in making the Fox River Valley a large pulp and paper producer and one of the leading manufacturing centers of Wisconsin.

Climate

The climate is representative of east-central Wisconsin. It is healthful, invigorating, and favorable to a mixed farming-live stock type of agricultural economy. The winters are long and severe. Temperatures

of $-20°$ are frequent, but temperatures below $0°$ rarely continue for more than a week at a time. The snow cover commonly remains from December to March and protects the winter crops of wheat, clover, and alfalfa. The summers are short and mild. Maximum temperatures of $100°$ occur, but such extremes are rare and hot periods seldom extend through more than a few days. The annual precipitation of 32.6 inches is ample for all needs, as about two-thirds comes during the growing season of 140–150 days.

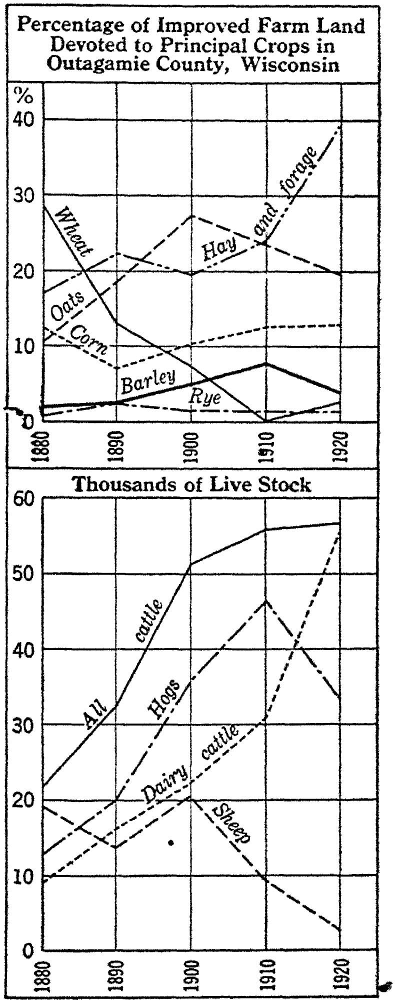


FIG. 141.

Hay and forage, oats and corn have become the leading crops with the development of dairying in Outagamie County. Wheat and sheep have become relatively insignificant in the present type of husbandry.

AGRICULTURE

Agricultural development began first along the Fox, as that was where the first settlements were made and where the forests were first cleared away. Following closely the lumberman as he advanced farther and farther into the wilderness, the pioneer farmer cleared away the stumps and established his small farmstead near the margin of the great expanse of cut-over land. These early settlers grew wheat, corn, potatoes, hay, and root crops for local use. Essentially all the merchantable timber has been removed and most of the region is now under cultivation. Though nearly 85 per cent of the county is in farms and nearly 70 per cent of the farm land is improved, there are considerable areas still undeveloped, particularly in the Indian Reservation in the north-east and in the low, wet lands of the northwest. (Fig. 141.)

During the long history of the region there has been no marked

change in the kinds of general farm crops grown, but the relative importance of some has changed greatly in the last half century. During the period from 1880 to 1920—for which census data are available—the proportion of improved farm land devoted to corn, barley, and rye fluctuated slightly, and the proportion devoted to oats made a substantial gain, thus indicating a strong tendency toward their permanent retention in the agricultural system. However, the wheat-acreage ratio declined from nearly 29 per cent to less than 3 per cent, and that of hay and forage increased from 17 per cent to nearly 40 per cent. During the same period the ratio of dairy cows to all cattle rose from 41 per cent to 98.6 per cent, while hogs tripled in numbers and sheep declined to about a sixth the number maintained in 1880.

Present-day agriculture consists of mixed farming and dairying. More than a third of the improved land produces cereals, principally oats, corn, barley, wheat, and rye. Nearly two-fifths produces hay and forage, more than three-fifths of which consists of cultivated grasses such as clover and alfalfa, nearly a fourth of silage crops, and a tenth of corn. Practically all crops yield an income. Some are sold directly from the farm, but most of the hay, forage, oats, and corn are fed to live stock and reach the market as dairy products, pork, and beef.

The raising of live stock is a very important industry and an integral part of the agricultural system, with dairying as the dominant branch. In 1920 there were 105 cattle and 62 hogs per square mile of land in farms. Nearly all the cattle are maintained for dairy purposes, all other types being insignificant in numbers. Much of this development has come in comparatively recent years. During the three decades prior to 1910, the ratio between the number of dairy cattle and all cattle fluctuated to some extent, but the gain was small. In the decade between 1910 and 1920 the ratio increased by nearly 44 per cent. This increase was nearly the same as the ratio that existed during the preceding thirty years. In 1924 the county had 79 cheese factories, 8 butter factories, 1 condensery, and 50 receiving stations, and produced more than 10,000,000 pounds of cheese and 490,000 pounds of butter. These figures depict the evolution of a dairy section and appear large when standing alone. However, in its output of dairy products, Outagamie County is exceeded by a dozen or more other Wisconsin counties where the industry has reached a higher stage of development.

Though it is more than 250 years since the first Mission was established in the Fox River Valley and more than 130 years since the first crops were grown in Outagamie County, a substantial type of agricultural economy has developed only within the last few decades, and more than a hundred thousand acres remain undeveloped. Opportunities

in other parts of the State and Nation that were more favorable to the gaining of a livelihood by agriculture have delayed the extensive occupation of these more northerly forested and cut-over lands. Though the present agriculture appears to be on a sound basis, the farm population has decreased more than 15 per cent since 1900. When will the whole Upper Lake Region reach a stage of agricultural development comparable to that of Outagamie County?

Urban Centers and Manufacturing

There are ten urban centers, ranging in population from 400 to 20,000, but only two centers exceed 5000. These ten centers contain more than three-fifths of the total population of the county, and their combined population increased 42 per cent during the last two census periods. All of the leading centers are along the Fox River where abundant water power and good transportation facilities are available. Appleton is the largest center and is a thoroughly modern and thriving industrial city. While the forests were near at hand the valley was one of the principal lumber, pulp and paper-making regions of the state; but as the forest frontier retreated farther and farther, these industries declined relatively. However, paper manufacture and various allied industries still lead. Appleton now has six large paper mills and two paper-converting plants. Its 88 manufacturing establishments give employment to about 5000 people and turn out products valued at approximately $30,000,000.[1]

Summary

Because of its location on the Fox River route between Lake Michigan and the Mississippi River, Outagamie County was traversed by the white man very early in the history of our country. Glaciation gave it a great variety of soils on a gently undulating surface, and many large marshland areas. Over all its upland the humid climate with long, cold winters and short, mild summers fostered a luxuriant forest growth. This combination of surface, climate, and forest made it the natural home of many fur-bearing animals and the Mecca of fur trader, explorer, and missionary to the Indian. Later came the lumberman to harvest the native forest. Then followed the farmer, who found the varied soils and cool summer climate conducive to mixed farming and dairying. The water power of its principal streams and the advent of modern transportation facilities likewise fostered the development of manu-

[1] Statistical data are for 1925 and were supplied by Appleton Chamber of Commerce.

facturing, especially the pulp and paper industries which drew their raw material from the hinterland. Though agriculture and other industries are firmly established, the process of human utilization of nature's resources is still in progress as there are large areas yet undeveloped.

THE RED RIVER VALLEY

The Red River Valley has long been famous for its fertile soils and high-quality spring wheat. Traill County, North Dakota, bordering the Red River of the North and lying midway between Fargo and Grand Forks, is a representative section. All of the county, except a few square miles of glacial moraine, lies within the limits of glacial Lake Agassiz. The northwestern two-thirds is covered by a glacial river delta which was formed in Lake Agassiz and which has a gently sloping, level to slightly ridgy topography. The lower lake bed to the east is nearly flat and is poorly drained. Numerous ditches have been excavated to carry off the excess water during wet seasons. The area as a whole presents a very flat to gently undulating prairie landscape broken only by groves of trees forming windbreaks about the farm homes, or a narrow belt along some of the streams. The soils are of lacustrine, glacial, or alluvial origin. The lacustrine deposits, which cover most of the region, consist chiefly of fine silt and clay-loam derived from glacial till, laid down in the quiet waters of Lake Agassiz and later weathered under very deficient drainage conditions. They carry a high percentage of humus and are dark-colored to black.

The winters are long and cold (average 8°) and the summers are cool (average 66°) but have a growing season of 130 days and sufficiently hot periods to be very favorable to the growth of hardy cereals. Extremes of temperature occur, but usually last for only short periods. The highest recorded temperature is 108° and the extreme minimum −41°. The autumn is commonly dry, with many weeks of warm mild weather, making fall plowing possible until the middle of November, when the cold of winter frequently arrives with a sudden cold wave which freezes the ground and stops all further plowing until spring. The area has a sub-humid type of climate with a mean annual rainfall of 22 inches, two-thirds of which falls in the spring and summer months. However, the rainfall varies considerably from year to year with wet and dry seasons occurring in more or less well-defined cycles. Low rainfall in some years and excessive rain in others may cause serious crop losses. The heavy rains are particularly serious on the lower, nearly flat and poorly drained lake-bottom lands.

Settlement

Traill County was among the earliest settled parts of the state. Most of the early settlers were of Scandinavian and German nationality, from Minnesota, Wisconsin, and Iowa. They found the country a region of rolling open prairie and settled along the larger streams which afforded means of transportation in the summer, where timber for fuel and building purposes was available, and where there was a water supply. In winter the grain crop was hauled overland to Fargo where supplies were obtained, and in spring and summer travel followed the river routes. Before railroads penetrated the region, the settlements were close to the rivers and most traffic was by boat, especially on the Red River of the North. With the building of railroads in the eighties, dependence upon the streams for transportation ceased and settlement soon spread to all parts of the region. The population in 1920 was 12,200, two-thirds of which was on farms and a third in five small villages, the largest of which—Mayville—had a population of 1200. From 1900 to 1920 the farm population decreased more than 15 per cent and that of the five towns increased nearly 18 per cent. However, the farm population averages about 9 to the square mile.

The towns serve as local purchasing centers and as shipping points. In addition, there are numerous sidetracks with grain elevators and other facilities for shipping farm products. No farm is more than 6 miles, and most farms are within 3 or 4 miles of some railroad point from which products may be shipped to market.

Agriculture

Agriculture is the one great industry of the region, and for many years it was of a one-crop type. The rich soils and the climatic conditions were recognized by the early settlers as being highly favorable to the growth of small, hardy grains. Spring wheat has always been the leading crop, and nearly 14,000 acres were devoted to it as early as 1880. In 1900 more than half (55 per cent) of the entire area of the county, and nearly three-fifths (59 per cent) of the improved farm land produced wheat. Twenty years later, less than three-tenths of the total area, and only about a third (34.7 per cent) of the improved farm land was occupied by the wheat crop. This decline in wheat acreage was accompanied by (1) an absolute decrease in acreage of improved farm land, (2) an increase in the percentage of improved farm land devoted to oats, barley, rye, corn, and cultivated hay and forage crops, and (3) an increase in the number of live stock maintained. This was a change

toward greater diversification, a change that is still in progress. The continuous growth of wheat on the same land results in decreased yield and an excessive growth of weeds. Though 30–40 bushels per acre may be produced in favorable years, the average is now 15 bushels. Conditions have fostered crop rotation and the use of crops, like corn, the cultivation of which reduces the growth of weeds and yields a profitable return for the season in contrast with summer fallowing. With this change is coming the production and fattening of more cattle, though grain growing still dominates and live stock is of relatively minor importance. (Fig. 142.)

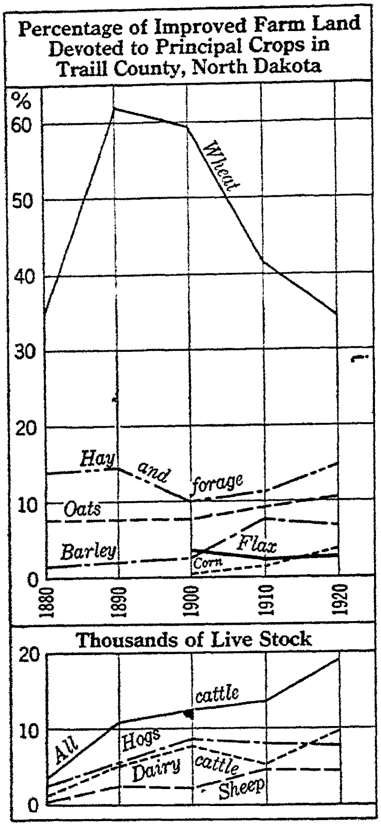


FIG. 142.

The great relative decline of wheat and the rise of cultivated hay and forage crops, including corn, are striking features in the agricultural economy of Traill County. These changes may be considered typical of the Red River Valley. They are accompanied by an increase in the raising and fattening of live stock.

The wheat lands are usually plowed in the early fall, oil-burning tractors pulling from two to eight plows being used extensively. Harrowing or disking is done in the early spring, and the seed is sown from April 1 to May 10. Harvesting time is a very busy season, and it is a common sight on the larger farms to see five or more binders following each other around the field, each cutting a swath of 7 or 8 feet. The grain is usually shocked and threshed from the field, and the straw burned to get it out of the way. Many operators of the larger farms maintain their own threshing outfits, but threshing on the smaller farms is done by outfits that go from farm to farm. Most of the wheat and other surplus grain is marketed in Minneapolis and Duluth.

Hay and forage crops now rank next to wheat in acreage, with nearly 15 per cent of the improved farm land devoted to them. Corn constitutes more than a fifth (22 per cent in 1919) of the acreage, and tame

and wild hay two-thirds. Other forage crops include Kafir, small grains, annual legumes, sorghums, etc.; and alfalfa, red and sweet clovers, and timothy are common types of tame hay. Though the short growing season is not favorable to maturing corn, more than 150,000 bushels are being produced annually. Nearly all the corn acreage produces fodder and ensilage, principally the latter, as it is more convenient to handle during the cold winter weather and more efficient use can be made of the unmatured crop when placed in silos.

Among cereals, the oat crop is next in importance to wheat in acreage, occupying a tenth of the improved land. Oats are the chief stock feed of the area. Much of the crop is an early-maturing type—60-day oats—which ripens before the hot, dry weather prevalent in the last half of July. Barley is another important cereal crop and has been grown for stock feed ever since the days of early settlement.

Flax became an important crop in the nineties for sod-breaking purposes, as the sale of the seed yielded an income the first year. It remained a leading crop while there were large areas of new lands to be brought under cultivation, and then declined, as it suffers seriously from wilt when grown on the same land in successive seasons. However, it is again being grown to break the stiff timothy and clover sod and is likely to remain in the agricultural system as hay crops are becoming established as a part of the rotation scheme. Other crops include rye, potatoes, and small fruits. About 4500 acres produce potatoes. They are grown throughout the area for home consumption and in numerous parts on a commercial scale. One of the most important potato centers is about Hillsboro, near the south central part of the county, where there are large storage warehouses and good shipping facilities. The best-quality potatoes and the largest yields are obtained on the sandier soils, but the crop is grown on all kinds of soil.

Though the live stock industry is relatively unimportant, it is receiving greater attention each year, and increasing numbers of animals, especially cattle and hogs, are being raised and fattened for market.

Summary

The development of the area has been rapid, its present prosperous condition having been attained in less than fifty years. In the eighties the best land could be purchased for \$8–\$10 an acre. In 1920 the average value was \$68 per acre with considerably higher values for well-improved farms located near good shipping centers. In the same year the value of all farm property averaged \$36,700 per farm. To-day the region has the appearance of a well-settled farm community with good

farm buildings and houses—many electrically lighted and equipped with running water—well protected by windbreaks, with more than three-fifths (62 per cent) of the farms operated by owners, with 93 per cent of the total land area in farms and nine-tenths improved. For many years the great wheat farms were very large, but they are now being broken up into smaller units. Though there are still some farms containing from 2500 to 5000 acres, the average size is now 409 acres. Most of the farms are small enough to be operated by the farmer and his family, with hired labor during only a part of the year. The early one-crop system of farming is giving way to diversification and wheat is becoming relatively less important.

WESTERN MARGIN OF HUMID SECTION

Central Kansas is on the eastern margin of the semi-arid Great Plains and the western margin of the humid section of the North Central States. It is also in the Hard Winter-wheat Region. Reno County, located in the south central part of the state, may be taken as representative of this marginal belt. Forty-eight per cent of its improved farm land is devoted to hard winter wheat, while in the counties on the west of it the proportion is 58–65 per cent, and in those on the east 20–40 per cent.

Settlement

The first settlers arrived in the early seventies and were homesteaders, principally from the Middle Western States. As a result of this method of acquiring land, most of the farms originally contained 160 acres. In more recent years the tendency has been toward larger farms or the renting of large areas in addition to the farmer's own holdings. At the last census the farms averaged 225 acres in size and more than half the farms of the region were operated by owners. In the early days the grasshopper pest and a number of seasons with deficient rainfall and consequent low crop yield checked settlement, but, on the whole, industrial development has progressed steadily since the advent of railroads. To-day there is a farm home on nearly every quarter-section except in the sand-hill and Red Bed sections where the soil is poor and the population is sparse. Most of the inhabitants are Americans, but there are a number of Russian–German and German communities. As in most other agricultural regions, the farm population has declined. From 1900 to 1920 the loss amounted to 25 per cent. During the same decades the village and city population increased 165 per cent, and that of Hutchinson alone nearly 149 per cent. Hutchinson now contains

more than half the people of the county. The present farm population averages about twelve to the square mile and, under the prevailing conditions of climate, soil, and general economy there is little indication that this average will increase materially in the immediate future.

Surface and Soils

Physiographically, the area is in the Great Plains. Its gently undulating surface slopes very uniformly downward toward the east and is intersected by three relatively narrow and shallow valleys. The present local elevation differences are due primarily to wind action and stream erosion. The maximum range in elevation is only about 400 feet, and this is due in large part to the general westward rise common to the Great Plains. The area contains four physiographic regions which differ in their adaptability to agricultural uses, viz., (1) the prairies, (2) the Arkansas River Valley, (3) the valleys of the Ninnescah and Little Arkansas rivers, and (4) the sand hills or dune areas. In general, the soils are brown in color and residual, alluvial, or eolian in origin.

The prairie region occupies most of the county and has a gently undulating surface with broad, gently sloping ridges that rise scarcely 20 feet above the adjacent depressions. It has numerous low-gradient, short, intermittent streams that flow in indistinct valleys. Along the western margin are areas of sandy, dune-like hills. The soils over most of the high prairies vary from silty loam to clay-loam and are somewhat heavy. They are best adapted to small grains, especially wheat. They are also good corn lands, but are not so good in dry years as the sandy loams. The principal crops in the prairie region include wheat, oats, corn, alfalfa, Kafir, and sorghum.

The Arkansas Valley bisects the northeastern quarter of the area and is a broad, shallow trench. It is 5–10 miles wide and 10–50 feet below the upland, but in places the valley and prairie blend so completely that there is scarcely any line of demarcation. The city of Hutchinson is situated in this valley trench, with South Hutchinson just across the river. The flat-bottomed valley is occupied to a depth of 100 feet or more by alluvial sand, gravel, and clay carried from the Great Plains and Rocky Mountains. These materials are good retainers of moisture absorbed from the winter snow and the rain, and serve as a water reservoir to supply wells and crops. Wheat, corn, alfalfa and numerous feed crops are grown on the loams and sandy loams. The fine sandy loam is very good truck and corn land and is the best soil for apples. The valley has many large commercial orchards, a few of which contain several hundred acres.

The Little Arkansas River Valley is 1–3 miles wide and crosses the northeastern corner of the area. It is a shallow sand- and clay-filled trench similar to the Arkansas Valley. On the south it merges into a sand-dune upland, and on the north into rolling prairies. The North Fork of the Ninnescah River and its tributaries have cut narrow valleys in the southern and western parts of the area. These flat-bottomed valleys are $\frac{1}{4}$–1 mile in width and 20–100 feet below the bordering hilly prairies. In the southeast, the river and its tributaries have cut down to the Red Beds, producing a more rolling and eroded surface. Here the soils are reddish-brown clay and very difficult to cultivate as they are too hard when dry and too sticky when wet. Though some crops are produced, much of this section is used for pasture and the population is sparse. In most other parts of this physiographic region, the soils are good and produce crops similar to those of the prairie region.

The principal dune regions are located chiefly north of the Arkansas Valley and in the northwestern and western parts of the county. The sand hills are 10–30 feet high and have numerous small marshy areas between them. They are rarely cultivated, but the coarse grass provides a poor grade of pasture for herds of cattle.

A Variable Climate

Since the county is in the transition belt between the humid and semi-arid portions of the country the climate wields a large influence in its material development. The growing season of 180–190 days is usually hot in midsummer with a mean temperature of 77° and a maximum of 109°. Periods of very high temperatures may last for several days, and 100° may occur frequently. There are also occasional periods when strong, hot, dry winds sweep over the plains, and crops are likely to be damaged seriously; but these winds do not occur frequently during any one season. The average winter is mild (34°), but some winters are very severe, with strong, cold winds, and an absolute minimum temperature of −24° has been recorded. Winter cold, however, does little damage to crops.

As a part of the Great Plains, the area suffers the precariousness of rainfall that characterizes that region, though to a somewhat lesser degree. The mean annual rainfall of 28 inches is adequate when it comes at the right time. The average rainfall for the growing season is 18.7 inches but varies from 11.6 inches to 26.7 inches. This variableness gives some seasons in which the precipitation is far below normal, or fails to come at the time when it is of greatest value for a mixed-farming, humid type of agriculture. Normally there is sufficient to

prevent a complete crop failure during any dry season, but the considerable seasonal fluctuations and high temperatures, combined with strong winds and high evaporation, maintain the element of uncertainty, and produce large variations in crop yield. With a small rainfall margin of safety, a comparatively small drop below normal converts the region from a humid to a semi-arid condition. Hence, "good and bad years" follow closely the amount and distribution of rainfall and summer heat. The winter snowfall of 21 inches is particularly significant in such an area of pervious soils, as most of the moisture enters readily. It is common practice to keep the fields rough and trashy in winter to prevent the snow from blowing away. Old straw is commonly spread upon the sandy soils to keep both snow and soil from drifting and to add mulch.

Agriculture

Agriculture is the dominant industry of the region. More than 95 per cent of the land area is in farms, and 85 per cent of the farm land is improved. Many farmers, especially on the heavier loam and clay-loam soils, specialize in one or two crops, producing them on an extensive scale. It is preëminently a land of cereals, especially small grains, with more than two-thirds of the improved land devoted to their culture. Wheat is the most important crop in both acreage and value and is likely to remain so because it can be marketed at any time, is well adapted to the soils, is better suited to large-scale farming methods with a minimum of labor than other available crops, and is probably a more certain crop under the climatic conditions than any of the other small grains. The broad expanse of level plains is highly favorable to the use of modern machinery. (Figs. 143, 144.)

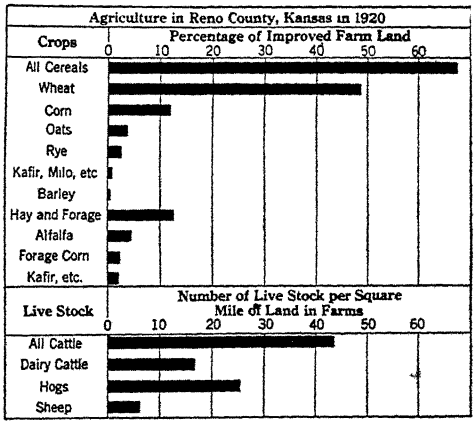


Fig. 143.

More than two-thirds of the improved farm land of Reno County is devoted to cereals and nearly half to wheat. All other crops, except hay and forage, are relatively unimportant.

Conservation of moisture is always a necessity, hence the wheat lands are commonly plowed or listed from the middle of July to late September

and worked down level with a mulch surface. Early working is preferable, as the soil is then in the best condition. Only hard winter wheat is grown, and the seeding extends from September 15 to November 1. June is harvest time, and the yield averages from 12 to 17 bushels per acre, though it varies considerably from season to season.

Corn, oats, rye, barley, Kafir, milo, etc., are all grown, but the acreage of each is very small compared to that of wheat. Corn occupies only 11 per cent, and oats less than 4 per cent, of the improved land, yet they rank next to wheat in importance. Corn is produced mostly on the sandy loams where mulching by cultivation reduces evaporation most effectively. The average yield of 15–20 bushels, compared with 50–60 bushels on the best soils in good years, indicates the sensitiveness of the crop to seasonal fluctuations in weather. Failure of rain to come at the right time—even if it comes at some other time—results in serious damage to the corn, as evaporation from the growing plant under hot winds is excessive. The corn land is commonly prepared by listing. Though this method has serious defects it has compensating advantages, as the trench and ridge produced lessen soil drift under the strong winds, and retain the snow—when the ground has been prepared in the late fall—and the moisture derived from its melting. The seed is planted in the bottom of the lister trench and the soil brought in about the growing plants by cultivation until the ground is again essentially level, and the crop has reached a height sufficient to prevent soil drift. The corn and oat crops are produced chiefly to feed farm animals. The oat yield is usually small, as the prevalent dry weather retards germination in the spring and the strong winds blow the soil away from the roots of the young plants. Barley and rye are commonly grown for pasture, but the acreage is small. Kafir is well adapted to dry seasons and to the soils, is one of the most certain crops, and is likely to increase in importance as a rotating crop.

Hay and forage crops rank next to wheat in acreage. However, they occupy less than 13 per cent of the improved land compared with 48 per cent for wheat. Three-eighths of the acreage produces tame hay, nearly all of which is alfalfa. Alfalfa is grown extensively, though it is difficult to get started on account of the strong winds and dry soils. Nearly a fifth of the land devoted to hay and forage produces forage corn; about 17 per cent produces wild hay; and nearly the same proportion, Kafir and sorghums. The coarse, wild, nutritious prairie hay is cut chiefly from meadows along the smaller streams and wet low areas among the sand hills. These crops are used for winter feed for farm animals and for fattening cattle.

The raising of live stock is of secondary importance as this is a land

of wheat and other small grains. Many hogs are produced in connection with general farming; but there are few large droves, and the total number is small compared with that of a Corn Belt county. Three-fifths of the cattle are of the beef type, and some are raised by most farmers. A few specialize in cattle but there is practically no "cattle ranching," as such is known farther west, though the sand-hill country supports many head. Large numbers of cattle and several thousand sheep are imported each winter and fattened on corn, cowpea, alfalfa, Kafir fodder, corn fodder, and wild hay. They are marketed chiefly in Kansas City. This is the most important phase of the live stock industry. About a fifth of the cattle normally maintained on the farms are for dairy purposes, and the products are principally for home consumption. Any surplus is marketed in the village or city centers, especially at Hutchinson, where there is a large creamery that purchases milk from an extensive territory in this part of the State. Main and branch lines of four large railroad systems cross the area and provide good transportation facilities to all the large markets, such as Kansas City, Chicago, Omaha, and Denver. Most farms are less than 6 or 8 miles from a railroad shipping point, but there are some in the northwestern part of the area that are 10–12 miles. Rural mail service extends to all parts of the county, and nearly every farm has a telephone.

Urban Centers

The region has a dozen urban centers within it, varying in population from 200 to 23,000. Nearly four-fifths of the urban population live in Hutchinson, which contains more than half the inhabitants of the county. Railroads radiate from it in many directions, and it is the chief distributing and shipping point for a large part of western Kansas. Wheat is brought here from a large territory, and cleaned, graded, and reshipped to other milling centers or to Galveston for export. The city has nearly a hundred manufacturing establishments, closely related to the resources of the region and to the needs of the people of the vicinity. Most of the enterprises are small, but seven produce products valued at more than a million dollars annually, and the total product-value of all the city's industries amounts to nearly $20,000,000. Among its industries are grain elevators, flour mills, and salt, straw-board, and soda-ash factories. More than 1700 wage earners are employed. Industries of the other towns are confined principally to creameries or milk-receiving stations, and the handling of grain. The value of their products constitutes about a quarter of the total product-value for the county, the remainder being produced in Hutchinson.

Summary

The gently rolling plains country about Hutchinson, with its generally fertile soils, is primarily a grain-producing area. It lies in that border region where a variable climate makes agriculture very precarious, though total crop failure rarely occurs. When rainfall is sufficient and properly distributed, and strong, hot, dry winds are not too frequent, prosperity reigns; but a succession of seasons with unfavorable weather may convert this area to a semi-arid land, and sweep away the gains of good years. This is a region where man presses his humid agricultural system into the margin of the semi-arid—a climate and soil to which small grains, especially winter wheat, are better adapted than most other crops—but where small returns must be expected part of the time. Even though the handicaps may appear severe, the average production is large; and the growth of cereals with the raising and fattening of live stock, is likely to continue to be the type of husbandry best adapted to conditions. Unfavorable weather in such a region produces not only poor crops and "bad years," but also human discontent which is reflected frequently in state and national politics. Because of the numerous "issues" or "movements" that have arisen in the Middle West, it may be called the "emotion region of the United States," and Kansas may be taken as the center. However much such a statement should be qualified, it is worthy of note that most of the "movements" originating in Kansas were associated with agriculture in the western two-thirds of the state. That the reasoning of its people on national problems should be different from that of people living in the manufacturing East is to be expected, since the outlook on life in the two regions is influenced by strikingly different geographic environments. Who can say which is right and which is wrong? May not the greatest good ultimately come from a mutually better understanding of the conditions under which each group of people live?

EXERICSE

Select some unit area, city, or industry, and prepare a written report after investigation has been made. Selection of a local unit will enable a student to combine knowledge gained by field work and that obtained vicariously. Printed source material on many phases of such a study is available in the publications of the U. S. Geological Survey, U. S. Census, U. S. Bureau of Soils, city chambers of commerce, various state government bureaus, etc. Lists of these publications may be obtained and an extensive library of source material built up.

CHAPTER XIII

THE PHYSIOGRAPHIC REGIONS OF THE SOUTH

The physiographic regions of the Southern States east of the Mississippi River are for the most part extensions of those of the Northeastern States, previously described. Although the surface, soils, and minerals are similar in the two sections, the southern regions differ enough from those to the north to demand further consideration. (Fig. 145.)

The Coastal Plain.—The Coastal Plain, which has a slight development, as we have seen, in New England, New York, and New Jersey, is almost entirely a southern physiographic province, for it borders the South Atlantic and Gulf Coasts, from Delaware Bay to the Rio Grande, and is much wider in the South than in the Northeastern States. In North Carolina it is 200 miles wide, and in eastern Texas more than 300. Its total area is about 365,000 square miles, with about 255,000 square miles in the South. (Data from Bull. 96, U. S. Bureau of Soils.)

The Coastal Plain and the Continental Shelf are the outer edges of the North American continental plateau, the Continental Shelf being the submerged portion of this plateau. The eastern shoreline of the continent has not always held its present position. At the beginning of the formation of the Coastal Plain, several millions of years ago, the shoreline was somewhere near the present inner border of the plain, and during these millions of years it has been gradually receding. The older deposits of the Coastal Plain are, therefore, at the inner border, and at the outer the advance of the land on the sea is still in progress. The rock of the Coastal Plain consists of marine deposits, the material being derived from the old land to the west and northwest. Since the Coastal Plain is young geologically, the rock material is largely unconsolidated.

From Hudson River to the Rio Grande, with the exception of southern Florida, the coastal features are much the same—sandy barrier beaches thrown up by the waves, smoothed in outline on the outer margin by along-shore currents, and separated from the mainland, except here and there, by tidal lagoons or salt-water marshes.

The barrier beaches that form a cordon along the shore are broken

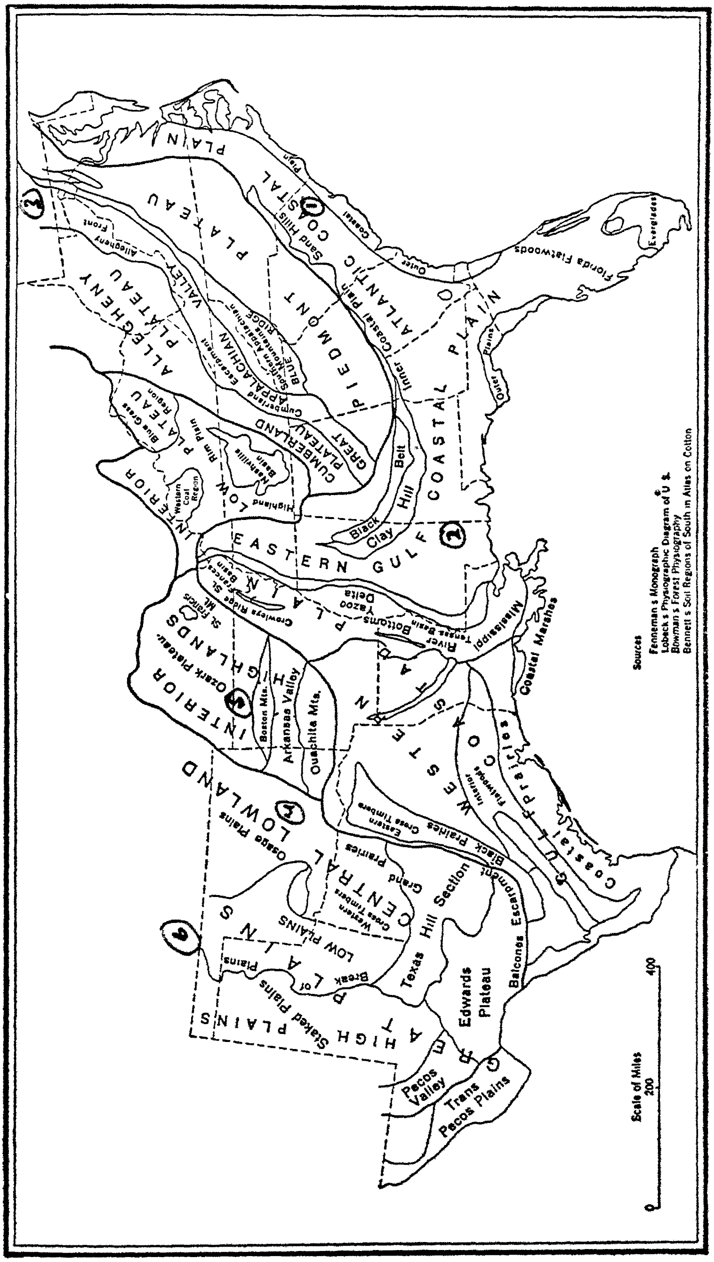


FIG. 145.—The Physiographic Regions of the South.

by numerous tidal inlets or by broad estuaries. Chesapeake Bay, Albemarle and Pamlico sounds, Mobile Bay, and Galveston Bay are the larger submerged bays and estuaries. Submergence has been greatest in the northern part of the Coastal Plain. In the Chesapeake Bay region it has been so great that tidal waters extend across the Coastal Plain, and Baltimore, Washington, and Richmond, like Philadelphia, and New York, although on the inner edge of the Coastal Plain, are reached by ocean vessels.

The rivers of the Coastal Plain in their lower course are aggrading streams, building alluvial flood plains and attempting to fill the estuaries by bars or deltas. This tendency toward the filling of the bays and estuaries, which are naturally shallow, as is characteristic of sandy coast lands, puts a great financial burden on our National Government in keeping these channels open for navigation in order that ocean vessels may reach the ports on the borders and upper reaches of the estuaries. This work has given deep navigable channels for ocean vessels to Baltimore, Norfolk, Wilmington, Charleston, Savannah, Brunswick, Jacksonville, Tampa, Pensacola, Mobile, New Orleans, Galveston, and Houston.

Interesting coastal features of the Atlantic Coastal Plain are the scallops, cusps, and off-shore shoals that occur on the coast of the Carolinas and affect coastwise navigation. These are attributed to the action of eddies that have a counter-clockwise movement and lie between the shore and the Gulf Stream. The material of the cusps and shoals comes from the outer edge of the Coastal Plain, from the shallow parts of the ocean bottom, or from stream deposits. That of the Cape Fear cusp and Frying Pan Shoal is derived largely from silt and sand brought down by the Cape Fear River. The more prominent of the shoals are those that lie off-shore from Cape Fear, Cape Lookout, and Cape Hatteras, the last-named being so dangerous to navigation that it is sometimes called the " graveyard " of the Atlantic Coast.

While submergence along the outer edge of the Coastal Plain has been of some advantage to water transportation, river, coastwise, and overseas, the estuaries hinder land traffic. Roads and railroads, paralleling the coast, generally lie inland beyond the heads of the estuaries. To reach the cities at the outer edge of the Coastal Plain, the more important roads and railroads are forced to follow the longer axes of the peninsulas that lie between the estuaries.

The Inner Border.—At only a few places on the inner border of the Atlantic Coastal Plain is the contact with the old land to the west a sharp one, either in surface expression or in mantle rock. In some parts there are prominent sand hills, but farther north sands and gravels

that show wave and river action, characteristic of the Coastal Plain, mantle the eastern edge of the crystalline rock region. In this zone of contact, most of the Atlantic Coast rivers have formed a series of rapids, in the larger rivers these are 15–25 miles long, as they flow over the crystalline rock at the edge of the old land into the valleys and channels which they have carved in the Coastal Plain. The line connecting the series of rapids has long been known as the Fall Line. At Baltimore the outer edge of the Fall Line zone is at sea level; at Augusta, Ga., it is 98 feet above tide; and at Macon, 280 feet.

The Peninsula of Florida.—The peninsula of Florida is a portion of the coastal platform or plateau that has been warped upward sufficiently to bring a large area of land above sea level. A small portion of Florida stands 300 feet above tide, but the larger part of the area of the state is below 100 feet, and all the southern third or more is below 50 feet. Limestone is the basal rock of most of Florida and is the surface rock of a large part of the interior.

The Gulf Coastal Plain.—The Gulf Coastal Plain is divided into two parts, east Gulf and west Gulf, by the alluvial valley of the Mississippi River. In the early period of the formation of the Gulf Coastal Plain, a great bay extended as far north as the site of the present mouth of the Ohio. Western Kentucky and Tennessee, eastern Missouri, and eastern Arkansas, therefore, form a part of the Coastal Plain, although 300–500 miles from the Gulf.

The Belts of the Coastal Plain.—The rock materials of the Coastal Plain are arranged roughly into longitudinal belts that are more or less parallel to the borders of the plain. It is this belted arrangement that has given origin to the term "belted coastal plain." Detailed study and mapping have revealed numerous belts, many of which are continuous across one or more states, but in our study we shall recognize but two: an outer, low, flat belt known as the Flatwoods and Coastal Prairies; and an inner and higher belt, called the Inner Coastal Plain.

The Flatwoods extending southward from Delaware Bay in a more or less continuous belt, with only a few interruptions, to the alluvial valley of the Mississippi, is about 20–40 miles wide. Its surface is almost a dead level with only a few sandy hillocks or broad, swamp-covered shallow valleys to break the monotony. Some areas are so flat as to be covered with water much of the year. Locally, such areas are known as "bays," "pocosins," and, in some sections, "swamps." They support a hydrophytic type of vegetation. These marshy patches on the uplands are distinctly different in origin from the marshes bordering the sluggish streams that meander through the Flatwoods belt. The former are merely inheritances from the elevated continental shelf; the latter

are the result of submergence of shallow valleys carved in the outer edge of the Coastal Plain when it stood at a higher level in very recent times.

The Flatwoods belt is interrupted in southern Georgia and southeastern Alabama by the Florida anticlinorium, but from Mobile Bay westward it is well defined. In the West Gulf region, this low, flat area, inland from the coastal lagoons and barrier beaches, is known as the Coastal Prairies, and in some parts of Louisiana and Texas is 50 or even 100 miles wide.

The inner belt of the Coastal Plain is much wider than the Flatwoods and Coastal Prairie belt, and is higher and rougher. North of North Carolina, most of the western belt lies less than 200–300 feet above the sea, with only the westernmost edge reaching 400 feet; but further south it is higher. In Alabama, Tennessee, Arkansas, and Texas, the inner border in general reaches 500–600 feet, and a few areas are 1000 feet above sea level. The higher altitudes of this inner belt and the looseness and unconsolidated condition of the material have given the rivers free scope in their work of dissection. The gradient of the Coastal Plain streams is less than the oceanward slope of the land, hence the valleys are deepest near the inner border of the Inner Coastal Plain. From central North Carolina to western Alabama, and even westward, there is a strip, 5–25 miles wide, of thoroughly dissected land known as the Sand Hill section, so hilly and so sandy as to be of little use except for the growing of forests and orchards.

The Black Belts.—In western Georgia, across Alabama, and in Mississippi, the hill region stands prominently above an inner lowland of calcareous materials, known as the Black Belt because of its dark soil which is admirably suited to the growing of cotton. Because of its adaptability to cotton growing, it has a dense Negro population. Texas also has a black belt, known as the Black Prairies, which is separated from another area of calcareous soil to the west, also with dark soil, called the Grand Prairies, by an outcropping belt of sand rock called the "Cross Timbers."

Minerals of the Coastal Plains.—Since the rock materials of the Coastal Plain are marine in origin and, probably, in no section have been disturbed by igneous intrusions or extrusions, the minerals must be such as are deposited in marine waters, accumulated in marine marshes and lagoons, or formed by chemical action subsequent to deposition. The more important minerals are salt, gypsum, sulphur, oil, gas, lignite, coal, marl, clay, and limestone.

The Mississippi Valley Plains.—The Alluvial Valley of the Mississippi is an aggraded plain 20–75 miles wide and 600 miles long. It is

bordered on the east by an almost continuous line of bluffs interrupted by only a few small streams. Its western border, although there are here and there low bluffs, is broken by several broad alluvial plains like those of the Arkansas, Red, Ouachita, and other rivers. The profile of the Mississippi River is concave, and the slope very gentle—4.8 inches per mile from Cairo to Vicksburg, 2.9 inches from Vicksburg to the mouth of the Red River, and about 2 inches from the Red to the head of the passes. As a result of these conditions, the stream is continually aggrading, and in flood stage its surface stands several feet above the level of the alluvial plain on either side. There are about 30,000 square miles of rich alluvial land between Cairo and the Gulf, and the larger part of this is subject to overflow during the flood period unless protected by levees.

The Piedmont.—The Piedmont Plateau lies just to the west and northwest of the Coastal Plain. Its length is about 900 miles and its width is from 20 miles in Maryland and 50 miles in central Virginia, to 150 or more in North Carolina. Farther south, it decreases in width. Its entire area is about 74,000 square miles. As one views its surface from the top of a high building in any of the Piedmont cities, one sees an almost perfectly dead-level plain with here and there a few low, rounded hills rising above the general level. These elevations are monadnocks, residuals, due to superior hardness and to location on the divide between river systems. Being in a region of heavy rains, the surface of the Piedmont is creased by many rivers and valleys, shallow and broad as a rule in the central portion of the Piedmont, but narrower on the eastern border. The larger streams pursue a course over the gently sloping surface toward the sea, irrespective, in general, of the hardness of rock; but some of the tributaries show rock adjustment. The channels of the larger streams, therefore, have numerous rapids and pools. Since the inner border of the Piedmont stands 700–1500 feet above the sea, and the outer from sea level to about 800 feet, the Piedmont streams have much water power. The slopes of the land are, as a rule, except near the inner border, gentle, and the relief slight. Railroads, therefore, find easy grades; topography has little influence on the road; and cultivation is little interfered with by rough lands. A large proportion of the land is tillable.

The rocks of the Piedmont are largely crystallines, so deeply weathered that in places the residual disintegrated rock is 50 or more feet thick. Igneous intrusions and extrusions are common. Most of the monadnocks, like Stone Mountain, near Atlanta, are intrusions. It is largely the intruded rock that is worked in the granite quarries of North Carolina and Georgia.

The inner edge of the Piedmont is marked by numerous outliers

of the Blue Ridge. The Piedmont Plateau and the Blue Ridge belt of mountains form in the South what is commonly known as the Older Appalachian, an expansion of the physiographic province of that name in the Northeastern States.

The Blue Ridge Province.—The Blue Ridge from North Carolina northward is a fairly distinct ridge of resistant rock flanked by numerous hills of sandstone and other hard rocks, which separate deep coves or valleys. In North Carolina and southward, the Blue Ridge is the eastern escarpment—some slopes of which rise 2000 feet in 3 or 4 miles—of the mountain area, the Southern Appalachian Mountains. This mountainous area, 75 or more miles wide in North Carolina, consists of several short, rather distinct, chains that lack uniformity in trend. There are numerous cross ranges, but some of the more prominent ranges, like the Unakas and Great Smoky, have a trend parallel to the general trend of the Blue Ridge belt. The crests of most of these mountains fall into a rather uniform plain when seen from a height of 2000–2600 feet, and are thought to be remnants of a former extensive plateau now so deeply dissected and destroyed by erosion that valley bottoms and mountain slopes take up most of the area. The peaks are rounded, and the slopes covered with a deep layer of mantle rock and humus, except where the removal of the forest has given the erosive forces full play. The most prominent of the mountain peaks is Mt. Mitchell, 6711 feet A. T., the highest mountain east of the Rockies. Other prominent peaks are Mt. Guyot (6636 feet), Grandfather Mountain, Mt. Pisgah, and Black Brother Mountain.

The rocks of the Southern Appalachian Mountains are largely metamorphosed igneous, but on the western border there are quartzites and slates. The summit of the Unakas on the western border is capped with resistant quartzites. The mountains yield a great variety of economic minerals, largely igneous in origin, such as rare earths, mica, feldspar, and metallic minerals, but nowhere in quantities great enough to attract much capital. It can hardly be classed as an important mineral region.

The Blue Ridge in Virginia is cut by three prominent streams, the Potomac, the James, and the Roanoke; and in addition to these there are a large number of wind gaps. All these gaps permit considerable freedom of movement of goods and people; but the Southern Appalachian Mountains are a distinct barrier to transportation and communication except along a few valleys. Asheville, in the Asheville Basin, carved in less resistant rock by the French Broad and two of its tributaries that here join the main stream, is a railroad center and the center of radiating highways. Agriculture is possible only in the valley bottoms and on the lower and less steep slopes of the Southern Appalachian Mountains.

Most of the slopes of the mountains are too steep for permanent cultivation and should be kept covered with forests.

The Great Valley.—The Great Appalachian Valley in the Southern and Northeastern States is similar in origin and general characteristics. In the South the larger divisions of the Great Valley are the Cumberland Valley in Maryland, the Shenandoah in Virginia, the Valley of East Tennessee, and the Coosa in Alabama. From the Potomac southwestward to southwestern Virginia, the Great Valley narrows to 8–15 miles in places; but in Tennessee it is from 40–60 miles wide. The highest part of the Great Valley in the South is in southwestern Virginia. From this higher land in southwest Virginia and the nearby portion of North Carolina, several streams take their rise: the James, Roanoke, New, Sandy, Clinch, and Holston. From Staunton, Va., northward, the valley slopes toward the Potomac and is drained by the Shenandoah. The Tennessee River and its tributaries drain southwest Virginia and east Tennessee, and the Coosa and its tributaries carry off much of the water of the Great Valley in Georgia and Alabama. From southwest Virginia to central Alabama, the valley slopes from about 2700 feet above sea level to about 500 feet.

There are no canoe-shaped valleys in the Southern States in the Great Valley, but evidences of intensive folding and faulting are common, and one finds the same repetition of rock-cored ridges as in the North. Many of the limestone beds have been metamorphosed into marble, which is being quarried in Tennessee and Georgia. Some of the marble outcrop ridges may be traced for scores of miles, but it is only here and there, where transportation facilities are adequate, that the marble is quarried. Most of the ridges of the Great Valley are of resistant sandstone or quartzite or of cherty dolomitic limestone. Some of the chert ridges stand up 100 or more feet above the nearby valley floor and, being too steep and sterile for profitable cultivation, are used as pasture lands or left in forest.

In Pennsylvania the dominant movement of men and goods in the Great Appalachian Valley is across the general trend of the topography, even though the ridges are distinct barriers; but in the South the movement has been largely along the valley, thus utilizing the low grades of the plains between the ridges.

From the early part of the eighteenth century, man has used this valley as a thoroughfare; first came the pioneer on his way to find a home in the valley, and later in the Bluegrass region of Kentucky and the Nashville Basin. In the Civil War it was the scene of bloody battles. The level surface, short ridges, numerous gaps in the Blue Ridge in Virginia, the mountain-like borders in Tennessee, and the continuity of

elevation with the Piedmont in Georgia and Alabama all influenced the movement of armies. Railroads and roads running along the trend of the valley find that low grades and the ease of communication north and south, coupled with valuable resources of coal, iron ore, and other metallic minerals, timber, agricultural products, and water power, favor the growth of industrial cities. Although most of these urban groups are small and unimportant at present, the future has much in store for them. The Shenandoah Valley has long been famous as an agricultural section, and during the last half century or more has come to be an important fruit region. The valley of East Tennessee and southward, while not so fertile as the Shenandoah basin, is one of the better agricultural areas of the South.

The Appalachian Plateaus.—Along the whole western border of the Great Valley, like a thousand-foot wall, stretch the Allegheny Front and the Cumberland Escarpment. They are the eastern edge of the Appalachian Plateaus. The Appalachian Plateaus region and the Great Valley are known as Newer Appalachia.

The New River and the Tennessee are the only rivers that have cut gorges across the plateaus, and only a few small streams have notched the eastern front. These Appalachian Plateaus and their east-facing escarpments are the most formidable barriers to transportation in the eastern United States. It was this barrier, with its southwestward trend, that deflected the westward-moving frontiersmen from Pennsylvania, Maryland, and Virginia southwestward to the Cumberland Gap.

There is little uniformity in the surface features of the Appalachian Plateaus in the Southern States. In Tennessee, erosion has been less active, and here exists the largest area, some 5000 square miles, of truly plateau land. There are a few elevations above and a few valleys, like the Sequatchie Valley in Tennessee, and numerous smaller valleys in Alabama, below the general level; yet, as seen from an eminence, its surface lies as flat as the surface of the outer Coastal Plain. Erosion has been more active in Alabama than in Tennessee; but it is in eastern Kentucky and West Virginia that the rivers have carried on their work of dissection most actively. In the latter states the former plateau level is indicated only by the accordance of the tops of the numerous ridges and knobs, which are the divides of that huge labyrinth of 800–1000-foot valleys and coves that dissect the plateau. The plateau in Kentucky and West Virginia is truly mountainous, for only in geologic history does it have real existence; but there is little excuse for the term Cumberland Mountains as applied to the Cumberland Plateau in Tennessee.

While the plateaus will not in our generation become important agricultural districts, they have rich stores of coal and building stones and are natural forest lands. They should not be denuded of their timber cover.

The Blue Grass Basins.—The basins of Kentucky (Blue Grass Region) and Tennessee (Nashville or Middle Tennessee Basin) and the surrounding highland plains form a distinct physiographic province, a part of the great Interior Plain. The basins were once domes, parts of the Cincinnati Anticline, the main axis of which lies parallel to the trend of the topography of Newer Appalachia. Erosion removed the more resistant cherty limestone of the domes and exposed the more easily eroded shales and limestones beneath, and the domes were etched into basins. The basins are rimmed about, with the exception of the north border of the Blue Grass Region, by escarpments 300–400 feet high, which force highway and railroad to employ many of the well-known engineering devices used in mountainous areas in providing traffic routes to and from the basins. The surface of the basins is gently rolling, interrupted here and there, particularly on stream divides, by hills or knobs of gentle slopes; yet the percentage of tillable land, some of the richest in America, is large. The minerals of the basins are few, limestone for building purposes, road ballast, plaster, and cement, being the chief. But to the south of Nashville are large deposits of phosphates which are mined in open pits, concentrated, and shipped to fertilizer factories, mainly in the South.

The Ozark Plateau.—Physiographers see, in origin and general surface features, a great similarity in the Ozark Plateau and the Boston and Ouachita mountains west of the Mississippi River, and the two provinces of the Newer Appalachian region just described. The Ozark Plateau corresponds to the Cumberland Plateau; the Boston Mountains, to the Escarpment; and the Arkansas Valley and the Ouachita ridges, to the Great Appalachian Valley. These areas west of the Mississippi may, therefore, be considered as outliers of the Newer Appalachians, separated from the province to the east by a downwarping of the land, the original surface features being covered with deposits of the Coastal Plain and the alluvial valley of the Mississippi.

West Texas and most of Oklahoma lie in two physiographic provinces: the Prairies, a phase of the Interior Lowland province; and the Great Plains, the latter being divided into the Low Plains and the High Plains. These two provinces have their greatest development in the North Central States. The Prairie Province is represented in Texas by the Black and Grand Prairies, separated by a cuesta of resistant sandstone known as the Cross Timbers, as previously described.

The western part of Texas in the Great Plains belt is classed in this book as a part of the West, and is discussed with the Western States.

QUESTIONS, EXERCISES, AND PROBLEMS

1. In a journey from Louisville, Ky., eastward to Norfolk, what physiographic regions would one cross? Describe each province.

2. What regions would one cross in traveling from Louisville to Florida by way of Nashville and Chattanooga, Tenn.?

3. What are the effects of the drowning of the coasts of the South, on agriculture, navigation, and commerce?

4. Why has the National Government not reclaimed the swampy lands of the South as it has the arid lands of the West?

5. Make a careful study of the most disastrous floods that have occurred in the Mississippi Valley. What physical conditions make for floods? Is flood-protection work a duty of the National Government or of the individual states? What engineering projects may be worked out to reduce the disastrous effects of the floods on the Mississippi?

6. What geographic conditions make western North Carolina a "playground" for both North and South? What contributions has man made to this phase of land utilization?

CHAPTER XIV

AGRICULTURE IN THE SOUTH

THE DEVELOPMENT OF AGRICULTURE IN THE SOUTH

Agriculture in the Virginia Colony.—Agriculture in English-America had its beginning in Virginia. Here was done much of the early Colonial experimenting in southern agriculture. The contrasts in summer temperatures between old England and the lower Chesapeake country led the people who directed the economic policies of the Mother Colony to believe that here could be grown many sub-tropical products. Sub-tropical and tropical products were much preferred, for in the growing of these the Virginia farmers would not compete with the farmers of the Mother Country. The fig, the orange, and the French grape were all tried out in the Jamestown settlement. The presence of the wild mulberry led the colonists to try the raising of silkworms. The cultivation of these was soon abandoned as being unsuited to climatic conditions, and farming activities were fixed upon two of the several cultivated plants the Indians had long been raising as staples, corn and tobacco. It is recorded that under the direction of Captain John Smith a crop of corn was raised in 1609, probably the first corn raised in English–America by Englishmen. Wheat, oats, and barley were sown later, with some success; but tobacco, the first crop of which was raised in 1612, soon became the leading money crop. It is reported that the people of Virginia were wont to say " God in the creation did first make a woman, then a man, thirdly great maize or Indian corn, and fourthly, tobacco." Cattle were introduced as early as 1609, and, by 1611, 160 had been brought across the Atlantic. By 1631 there were about 5000, of English and Irish breeds chiefly, although some had been brought from the Spanish West Indies. Horses were the first live stock to reach Virginia. Goats and hogs multiplied with great rapidity, but it was not until the close of the seventeenth century that sheep were at all numerous, for they easily fall a prey to wild animals in a newly settled country.

Agricultural practices were chiefly those of old England, with some slight modification due to Indian influence. For tobacco and corn, hand labor was used. Little could be done in the growing of cereals until

plows became common. In 1618 there was only one wooden plow in the colony; and thirty years later, when the population numbered 15,000 whites and 300 slaves, the majority of whom were tillers of the soil, only 150 were in existence.

The settlement on the James River was the nucleus for agricultural expansion northward, southward, and westward; but always, for more than half a century, the new settlements were planted on or near tidewater, that contact might be maintained with the Mother Country.

The rapid depletion of the soil by tobacco culture, the resultant migratory agriculture (a field was rarely cultivated more than three to six or seven years before being abandoned), and the increasing number of colonists, particularly near the middle of the seventeenth century during the Civil Wars in England, brought about a rapid expansion of the agricultural area. By 1620 the Jamestown settlement had expanded up the James River 70 miles, and extended back from the river on either side a distance of 20 miles or more. About forty years later, there were almost continuous settlements from Maryland to the Albemarle country.

Expansion of the Agricultural Area.—By 1700 a few farmers had gone far inland on the Piedmont, but most of the settlements were to the east of the Fall Line. The Great Appalachian Valley was entered by farmers by 1750, and in this great thoroughfare Virginians mingled with land seekers from Pennsylvania, Maryland, and New York. Thirty years later, hundreds of hardy farmers, following daring hunters and traders, were crossing the Appalachian Highlands and staking out farms in the Monongahela and Ohio Valleys, the fertile Blue Grass region of Kentucky, and the Nashville Basin; and by 1790 there were in southwest Pennsylvania and nearby portions of Ohio and West Virginia and Kentucky nearly 74,000, and in Tennessee nearly 36,000 pioneers. From these centers people spread out into other parts of these states and nearby states, being guided in their movements largely by the rivers, and planting their new settlements for the most part on the more fertile lands, for always the great majority of migrants were farmers. Kentucky and Tennessee contributed large quotas to the early settlers in Indiana, Illinois, Missouri, Arkansas, Alabama, Louisiana, and Texas.

In all this back country, the crops and agricultural practices were somewhat changed from those early used in Virginia; general farming was the rule, for each community was by necessity largely self-supporting and the crops raised were supply crops.

Agriculture in the Carolinas.—The settlements in northeastern North Carolina were an expansion of those of southern Virginia. About a hundred farmers had settled at Chowan on the shores of the broad Albemarle Sound by 1653. Nine years later, large accessions, in which

Quakers predominated, were made to the Chowan settlement. By 1665 there were three or four hundred families on the borders of the Sound. In time the Albemarle settlements expanded westward over the Piedmont, and a hundred years or more later the Carolinas sent land-hungry pioneers into the eastern Tennessee and trans-Allegheny regions.

In 1664 a few English colonists from Barbados cleared the bottom lands along the Cape Fear River, well back from the coast, and began the cultivation of cotton. The Charleston settlement dates from 1670. Cotton was from the first much cultivated. These settlements grew rapidly, and it is claimed that by 1732 there was not a thousand-acre tract within 100 miles of Charleston or within 20 miles of a navigable stream that was not claimed as farm land by English, New England, Scotch-Irish, Dutch, French Huguenot, Acadian, or English Quaker colonists. The introduction of rice culture, and, a half century later, of indigo, added greatly to the wealth of the communities.

The Georgia Colony.—In the Georgia Colony, the first settlement was at Savannah in 1733. Rice, indigo, and upland cotton received attention; but sea island cotton from the first proved a profitable money crop, and its cultivation spread rapidly on the coast islands.

Rice, indigo, and sea island cotton were coast products, and hence they played little or no part in the expansion of agriculture in the Lower South. As long as the colonists of the Lower South hugged the coast-line, these products dominated in agriculture; but it was upland cotton, with which the upland farmers had long been experimenting, that brought about the great westward movement in agriculture in the Lower South.

Early Practices in Agriculture.—In an era of agricultural expansion, with large areas of virgin soil that were purchased in large blocks at only a nominal sum, little attention was paid to improvement in agricultural practices. Extensive agriculture, rather than intensive, was the rule, for, as long as new lands could be had, greater profits could be obtained by soil robbing than by careful tillage. "Tobacco raised by slave labor economically was thought to demand fifty acres of arable land per Negro, and as an overseer was dear unless he had twenty Negroes under him, a thousand acres of arable land, it was thought, was necessary for the profitable use of capital."

The same condition held true for cotton. Here and there attempts were made at improvement in methods of cultivation, in live stock, and in machinery. Virginia and Maryland, grown poor by the exhaustive cultivation of tobacco, were among the leaders in agricultural improvement. A State Agricultural Society was founded in Virginia in 1790. Baltimore had a *Farmer's Weekly* in 1835, and a chair in agriculture was

established at the University of Georgia in 1834. Yet it is claimed that until 1856 a plow was almost unknown in many counties in South Carolina.

Modernizing Agriculture.—Machinery, until recently, has never been much used in the Southern States. There has long been a prevalent notion among southern farmers that the Negro, whose chief implement for a century or more in America was the grub hoe, could not handle machinery. This idea, however, is fast being changed. It is only in recent decades that the South is beginning to multiply its man power by the use of power machinery. It should be remembered, however, that for many of the southern crops satisfactory machinery has not been invented. The longer tillage and growing season partly compensates for the inadequacy and the scarcity of farm machinery. A farmer has many more days in the southern States to fit his ground for planting or sowing, and a longer harvest season, than the farmer of the Northern States, and thus has less need for machinery. (Fig. 146.)

To-day no section of the country is changing its age-long agricultural practices and traditions so rapidly as the South, chiefly because there is a great chance for improvement. The boll weevil, although destroying hundreds of thousands of bales of cotton each year, is, after all, proving a blessing. The one-crop system is doomed. Farmers are learning that more money is to be made from semi-luxuries, like citrus fruits, peaches, apples, early vegetables and small fruits, and dairy products, than from the staple foods and fibers.

FACTORS AFFECTING AGRICULTURAL PRODUCTIVITY

Agriculture is predominantly the occupation of the people of the Southern States. While the South has but 31.3 per cent of the total population of the country, it has 46.3 per cent of the rural population, and only 17.1 per cent of the urban. Although agriculture dominates the activities of the people, the South is not to-day so great an agricultural region, from the standpoint of production, as the Northern (Northeastern and North Central) States. The total land area of the two sections differs but little; the North has 30.9 per cent of the land area of the United States, and the South 29.8 per cent; yet the South has only about 80 per cent as many acres of farm land as the North; and the area of improved land is only 54 per cent of that of the North; the value of farm property, 36 per cent: and the gross value of all agricultural products, about 72 per cent.

This lower ranking is not wholly, if at all, the result of natural geographic conditions adverse to the farmer. It is probable, as later

discussion will try to show, that the physical environment of the Southern States is quite as favorable for agriculture as is that of the North.

The Population Factor.—The rural population in each section numbers about the same, but the North has nearly twice the total population. Although the two sections are similar in age of settlement, the North is older in its economic development. There are, therefore, fewer acres per person of total population than in the South. The value of the agricultural land is greater, more extensive improvements have been made, the land is tilled better, and consequently the returns are greater. Agriculture has reached a more advanced stage of development, and man is utilizing nature's resources to a fuller extent than he does in the South.

The Southern States are not advancing, in percentage increase, in agriculture as rapidly as the West; but in most phases of this activity greater than for the country as a whole.[1] Table X is a comparison showing the percentage of increase in a few items related to agriculture in the three major sections of the United States:

TABLE X

PERCENTAGE OF INCREASE, 1910 TO 1920

Increase in	North	South	West	U. S.
Rural population (in territory rural in 1920)	1.5	6.4	25.3	5.4
Number of farms	−4.4	3.5	28.1	1.4
All lands in farms	4.5	−1.2	56 5	8.8
Improved land in farms	.7	4.2	42.2	5.1
Value of all farm property	83.3	102.6	102.9	90.1
Value of farm land and buildings	83.2	106.1	106 3	90.6
Value of farm implements and machinery	.80	162.9	265.2	184.1
Value of live stock on farms	55 7	69 5	81.6	62.7

The chief reason for the excellent showing the South is making in percentage increase is that it is yet a young agricultural region, younger than the North but older than the West. In the South are large areas of forests yet to be cleared, much cut-over land adapted to special types of farming, and more than 60,000,000 acres of wet land capable of very extensive cultivation when once drained. These lands will be used

[1] In "quantity" increase, however, the North Central (dividing the North into North Central and Northeastern) Section leads by far and the South surpasses the West and the Northeast in most items.

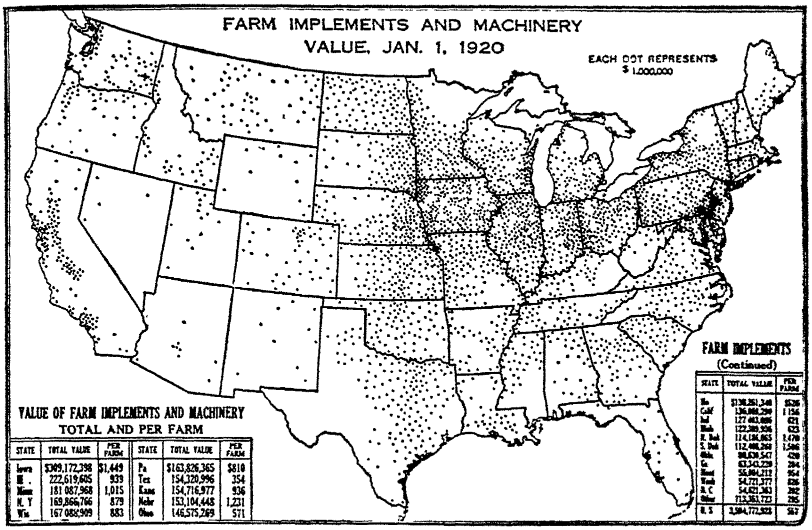
more and more as population increases. The 100,000,000 acres of woodland on the farms will furnish nearly 1,000,000 of the average-size farms of the South, and the 200,000,000 acres of the unimproved farm land could furnish 2,000,000 more.

Tenancy and Size of Farm.—Tenancy is more prevalent in the South in general than in the other major sections of our country. The percentage of "improved land operated by tenants and croppers" in the North ranges from 48 for Illinois, 45 for Iowa, 41 for Kansas, down to 23.5 for New York, 15 for Vermont, 6.6 for Massachusetts, and 3.8 for Maine. In the West 9 per cent of the improved land of Nevada is so operated, 13 per cent for Montana, 29 per cent for California and 33 per cent for Washington. In the South the figures are 14 per cent for West Virginia, 21 for Virginia, 38 for North Carolina, 32 for Tennessee, 56 for South Carolina, 58 for Georgia, 49 for Mississippi, 48 for Texas, 41 for Arkansas. The Wheat Belt, Corn Belt, and Cotton Belt have the larger percentage of tenants. The evil effects of tenancy need no comment. Census data indicate that, while tenancy is on the decrease in most parts of our country, there is little change in the South. "In the North and West the tenant farmer is normally working toward buying a farm, and his tenancy thus represents merely a stage on the way to ownership. In the South, on the other hand, there are large numbers of tenants who do not look forward to ownership and for whom tenancy is the normal economic situation."

Since the Civil War there has been much splitting up of large plantations, yet not enough for the best agricultural interests of the South. The census figures are very misleading as to the size of the land holdings. They show that in 1920 nearly 50 per cent of the farms of the South had less than 50 acres; 72 per cent, less than 100; and only 1.8 per cent of the total number, more than 5000 acres; and that in the South Atlantic States the average size of the farms had decreased from 376.3 acres in 1850 to 157.4 acres in 1880, and 84.4 in 1920. In two other divisions of the South there had been similar decreases. But a farm in the census reports "is all the land which is directly farmed by one person managing and conducting agricultural operations either by his own labor alone or with the assistance of members of his household or hired employees. . . . When a land owner has one or more tenants, renters, croppers, or managers, the land operated by each is considered a farm." A large percentage of the plantations of the South are divided into plots and rented out to tenants, mostly Negroes, each "one-horse" or "two-horse" farm being considered a farm by the census, although the owner, in many if not most cases, exercises almost complete control over the tillage. Tenants of this sort are at the best only poor agriculturists, and undoubt-

edly the plantation as a whole would yield much more than the present output if it were divided and tilled by owners.

The Long Distance to Market.—The long haul to the greater markets of the country is a factor that has retarded agricultural development. Of the crops that are raised in both North and South, it is only the early crops of the South that can compete successfully in the northern markets. The development of industries in the South, and an increase in the consuming population accompanying each development, will prove a great advantage to the farmers. The larger population will increase



Courtesy U. S. Department of Agriculture.

FIG. 146.

The long growing season, the types of crops, and the cheapness of Negro labor are the leading reasons for the low rank of the South in farm implements and machinery. Although a southern farmer saves money in his equipment, his producing power is much less, in fact many times, than that of a northern farmer.

land values, increase taxes, and force the farmers to get more out of their land.

The Soil Factor.—Of soils, the South has a great variety, both as to origin, chemical composition, and physical characteristics. There are rocks of every variety, and of every geologic age, and all the soil-making and soil-transporting agencies, except glaciers, have been at work. Residual soils from ancient crystallines, and moderately old metamorphic and sedimentary, as well as later sedimentary rocks predominate.

The classification of the soils, as developed by the United States Bureau of Soils, is largely based on their color and texture, and these

characteristics are determined by the lithological composition of the rock from which they were originally obtained, the geologic forces involved in their preparation and in their transportation and deposition, if they are transported soils, and their subsequent history as affected by climate, topography, and man. The boundaries of the soil regions of the South are similar to the boundaries of the physiographic provinces. (Refer to Fig. 145.)

Soils of the Coastal Plain.—Bordering the Atlantic and Gulf is the Atlantic and Gulf Coastal Plain Province, its inner border being the same as that of the physiographic province of the same name. Quartz forms a larger part of this soil, for the material brought down from the interior by the rivers was subject to solution and abrasion en route, and even after being deposited at the borders of the ocean was subject to further solution and comminution by the waves and currents. Most of the soluble parts have been dissolved out, and the less resistant parts worn into fine particles and carried long distances. Over the Coastal Plain, sand and sandy loam soils, therefore, predominate. In Florida the sands rest on clay or calcareous rock, and the Coastal Prairies of Louisiana and Texas are calcareous and dark in color.

The most fertile portions of the Coastal Plain Province are belts of level alluvial soil along the many rivers that cross the plain, the black belts of Alabama and eastern Mississippi, and the prairies of Central Texas. The Black Prairie of Texas is the largest and most fertile of the black soil regions. In this region are Austin, Fort Worth, and Dallas. The soil of the black belts is chiefly dark to black clay and clay-loam derived from marls, and has long been producing profitable crops of cotton and corn.

The soils of the Coastal Plain Province are of so varied a character, and the province extends through so many degrees of latitude, that a wide variety of products may be grown and are now being grown. In this province, to quote from a Bureau of Soils bulletin, "is a tremendous area of medium to excellent general farming soils and vast tracts of special-purpose soils preëminently adapted to highly specialized industries requiring the most intensive and expensive methods of cultivation. . . . Where properly supplied with organic matter, fertilized and cultivated, millions of acres of these sandy lands are being profitably used in the production of a vast variety of crops, such as cotton, corn, oats, forage crops, peanuts, a large number of vegetables, melons, small fruit, peaches, plums, oranges, and pineapples." The Coastal Plain Province has vast areas of cut-over land that may be purchased at very low prices.

Soils of the Piedmont.—In the Piedmont Plateau Province the soils are residual, old, and, therefore, well decomposed chemically, leached, and deep, except on slopes. Sandy loam, clay-loams, and clays predominate and are reddish in color owing to the oxidation of the iron oxides. The subsoil is much more compact than the surface soil. In many parts of the Piedmont the lighter surface soil on an impervious subsoil base offers the best conditions for soil wash and gullying. The control of soil erosion is a problem on most farms, particularly in the southern portion where the winters are not cold enough to freeze the ground. In the northern sections of the Piedmont, the snow and ice cover checks winter erosion; and the freezing of the soil water produces an open structure in the soil which favors sink-in during the summer.

The heavier soil of these provinces requires heavier agricultural implements than are used in the Coastal Plain. As the soil is fairly uniform in quality and lithological composition, the variety is not great. Differences in temperature, due to a wide range in latitude and altitude, are an important factor in crop distribution. Cotton grows southeastward of a line from Petersburg, Va., to the southern end of the mountains in northern Georgia. Corn and other cereals, legumes, tobacco, and fodder may be produced over the entire area. Tobacco, however, is confined chiefly to southern Virginia and northern and western North Carolina. It is also grown on the Coastal Plain in both North Carolina and South Carolina.

Soils of the Southern Appalachian Mountains.—Similar to the Piedmont soils are those of the cultivated valleys of the Southern Appalachian Mountains and the valleys bordering the Blue Ridge. They are partly alluvial and partly colluvial, derived from the igneous and metamorphic rocks that form the mountains. Except along the major valleys that are traversed by railroads and hard-surfaced roads, farming is confined chiefly to the production of home supply crops. Mountains in most parts of the world are a natural habitat for the live stock industry, particularly where the mountain areas rise above semi-arid and arid plains or plateaus. A beginning has been made in the Southern Appalachians in the production of butter and cheese, scattered patches of mountain pasturage being utilized; but the mountain slopes are too densely wooded in their natural state to permit the growth of an abundance of fodder, nor do they rise sufficiently high for the development of *alps*, as in Europe. Truck gardening and fruit raising are increasing in importance.

Cherty Limestone Soils.—The Great Appalachian Valley in Tennessee, Georgia, and Alabama, the Highland Rim Plain bordering the Nashville Basin, and the broad expanse of the Ozark Plateau are all

included in the same soil class. The soils are residual and are chiefly yellow to red silt loams, derived in the main from limestones that contain large quantities of chert or other siliceous matter. The loams in places are stony, particularly in situations where rain wash or leaching has been active. In the Great Valley the variety of rock is more diverse than in the other provinces, for reasons previously discussed, the dolomite limestones, with some sandstones and shales, furnishing the bulk of the soils. In the Highland Rim Plain and the Ozark Plateau, the rocks lie practically horizontal, and hence the soils are uniform over large areas. Solution, by which the calcium carbonate has been removed, leaving insoluble material, chiefly silica, is the dominant process in soil formation. The amount of residual soil formed depends upon the purity of the limestone. One hundred feet of limestone that is nearly pure may yield but a few inches of siliceous residual. Chert occurs in such quantity in some of the limestones as to form a thick mantle and thus protect the bed rock from rapid weathering. In the Appalachian Valley such cherty limestone forms ridges (as earlier stated). Chert residual is largely responsible for the steep slopes bordering the Highland Rim. The yellow to red color is due to the oxidation of the large quantities of iron compounds. In some areas the red is nearly as deep in tone as that of the hematite iron ores of the Lake Superior district. Much of the land of these physiographic provinces is tillable and, although needing in some places a liberal application of lime, has sufficient soluble mineral matter for good crop yields. These regions are adapted to the production of general farm crops, fruit, and fodder.

The Limestone Regions.—The Great Appalachian Valley in Virginia and Maryland, the Nashville Basin, and the Blue Grass Region, also have soils derived largely from limestone, but with a low siliceous content. There is much humus as a rule in these soils. They are dark brown, silty loams and are highly productive. In some sections they are rich in phosphates and are among the most fertile soils of the South. Soils similar in color and texture are to be found in the prairie areas of central Oklahoma and northern Texas.

Mountain and Plateau Soils.—Yellowish silty to stony loams have a wide areal distribution in the Cumberland and Allegheny Plateaus, the Boston and Ouachita Mountains in Arkansas, and the Coal Measures region of Western Kentucky. In most respects this soil is derived from marine sandstones, poor in soluble mineral matter, porous, well drained and well aërated, similar in many respects to the soils of the Coastal Plain. This soil is only moderately productive, yet is well suited for special types of farming and when handled properly can be made to yield profitable returns.

The Loessal Area.—A large area of loessal soil some 15–40 miles wide extends along the eastern edge of the alluvial valley of the Mississippi from the Ohio to within a few miles of Lake Pontchartrain. Loess is found here and there on the west side of the Mississippi Valley, but it is only in patches. It is believed that these wonderfully fertile, fine, buff-colored, silty deposits, so well seen in the bluffs and borders of ravines at Memphis, Vicksburg, and elsewhere, were brought southward from the glaciated area by the river, deposited in bars, and carried by winds to the bluffs bordering the valley. Loessal soils are adapted to intensive cultivation, truck gardening, and the raising of small fruit. The loessal province is an area of well-tilled soil with little unused land.

Soils of the Arid Lands.—All the western part of Texas and Oklahoma lies in the Great Plains region, the soils of which are derived from the weathering of sedimentary rocks, chiefly by mechanical processes. Since chemical decomposition and solution have never been active, the soils have almost the same mineral constituents as the bed rock. The dominating factor in agriculture in this portion of the South is not soil, but climate. The chief problem of the agriculturist is moisture control. (The problems of the agriculturist in the dry lands of the United States will be discussed in a subsequent chapter.)

Alluvial Soils.—The alluvial soils of the numerous river flood plains are among the best in the South. The largest alluvial area, along the Mississippi River from Cairo to the Gulf, 550 miles or more long, 75–100 miles wide, has soil as fertile as the famous plains of Mesopotamia and possibly the Nile Valley. The Colorado, the Brazos, Red, Arkansas, and many shorter rivers to the east have in the aggregate many thousands of square miles of alluvial lands. The soils vary from clays, silt-loams, and loams, to sand and gravel. There is little gravel, however, in the larger flood plains. The mineral composition of the alluvial soils varies greatly in the different valleys. In general, the soils are well mixed lithologically, for the material deposited in the flood plains of the larger rivers comes from diverse physiographic regions.

Some of the alluvial valleys have long been under cultivation—were, in fact, the first lands to be taken up by Colonial farmers, for the navigable rivers of the Coastal Plain gave them an outlet to the ocean for their products. Cotton and corn have long been the chief crops of the alluvial soils.

Factors Affecting Soil Fertility.—Although a statement as to the relative fertility of the soils of North and South, considering the areas as a whole, is difficult to prove and needs many qualifications, we know that the North is more productive than the South, and most soil students would attribute this to the higher fertility of the soils.

The soils of the South are almost entirely the result of chemical weathering. Reds, browns, and yellows predominate in color, showing active oxidation. Most of the area of the South is in slope and subject to surface wash and rapid drainage and leaching. The mild winters permit soil wash and leaching to continue, over most of the South, twelve months in the year. In most parts of the Northern States the soil is a sheet of frozen solid rock, as impervious as a slab of slate, for four or more months each year. There is, in general, less humus in the soils of the South than in those of the North, for the high temperature dries out the ground and " burns out " the humus. Southern soils, in general, are lighter in color than those of the North. As an evidence of low fertility of the soils of the Southern States, one may point to the fact that farmers, to secure profitable fields of crops are forced, in many parts, to use large quantities of fertilizer. In 1919 the farmers of the North used $96,500,000 worth of fertilizer, while the value of that consumed in the South was $219,900,000.

The Climatic Factor.—But there are conditions, other than mineral composition and physical conditions of soils, that influence the productivity of a region. One of the more important factors is climate. Soil students in recent decades have come to realize that climate has a strong influence on the character of the soil (as indicated above), besides being a factor operating on the plant itself, influencing the activity of the protoplasm, the rate of photosynthesis, the rate of transpiration, and the water content of the cells.

The South is a favored section of the country when the climatic elements that affect plant growth are considered. Of all the climatic factors, rainfall and temperature are the two most important.

The Abundant Rainfall.—More than three-fourths of the area of the South receives 40 or more inches of rain each year, and three-eighths of the area gets 50 or more inches. About 8 per cent has less than 20 inches, and 16 per cent less than 30. Of the 902,000 square miles in the South, about 120,000 square miles must be classed as semi-arid, where agriculture is profitable only by employing moisture-conservation methods and where cattle and sheep raising is the dominant phase of land utilization. Eastward from the 30-inch isohyet, humid agriculture is everywhere possible. (Figs. 9, 13, and 16.)

The rainfall is well distributed throughout the year. Western Texas, most of the Gulf region east of Texas, and the South Atlantic States, including West Virginia, receive 30–40 per cent of the rainfall in June, July, and August. In Central Texas and most of Oklahoma and Arkansas, spring rains are the rule, about 30 per cent coming in March, April, and May. Over most of the remainder of the Southern States a

late summer minimum is the tendency, yet the driest month, on the average, differs from the wettest by only 2 or 3 inches. Texas and Oklahoma, bordering the arid lands of the West, are subject to long spells of dry weather; two, three, and even four months of drought are common experiences. Droughts do occur in other sections, and there is rarely a year that crops are not retarded in their growth by dry weather. Widespread crop failures east of the semi-arid region are of rare occurrence.

The Temperature Regions.—With a latitude extent of 15° or 1000 miles, and altitudes varying from sea level to 5000 or 6000 (Mt. Mitchell, 6711 feet), there is scope for a wide range of temperature conditions in the South. (Review the Temperature-region map of North America.) The most important temperature conditions affecting agriculture is the long growing season and the early advent of spring. How man has adjusted his agriculture to these factors will be discussed in the following sections.

In a large part of southern Florida and southern Texas, crops are grown the year around. In a strip of country bordering the Gulf, 50–75 miles wide, there are, as a rule, no frosts between March 1 and December 1. All of the Lower South has at least seven months of growing season and, except for the mountain-plateau areas, all of it has at least six months. (Fig. 100.)

Effect of Passing Highs and Lows.—While the Southern States lie to the south of the major paths of the passing Highs and Lows, their effect is generally felt as far south as the Gulf. The low relief of the Great Central Plain, extending northward from the Gulf, permits the free passage of air, warm from the south, cool or cold from the north. The presence of a well-developed, slowly moving High in the central United States in the winter often brings freezing weather to the Gulf Coast and far into Florida. At such times great harm is done to vegetation and crops, and consequently cold spells have been closely studied and recorded. The earliest recorded freeze occurred in January, 1766, when fruit trees were killed in St. Augustine. Probably the coldest weather that has ever been felt in Florida occurred February 7, 1835, when the temperature at Jacksonville fell to 7° below zero, the St. John's River had ice on its borders, and all fruit trees were killed. Only since 1871 have official records been kept. Since then freezing weather has occurred in central Florida in 1880, 1886, 1894, 1895, 1899, 1900, and once or twice since. Since the citrus-fruit industry has reached the commercial stage, two disastrous frosts have occurred, in 1886 and 1894. Western Texas also suffers greatly from "cold spells." A "norther" in western Texas is a phenomenon always dreaded in the winter. People suffer greatly, and even cattle on the open plains are frozen by the hundreds.

Optimum Conditions for Plants.—In most parts of the South, east of the 100th meridian, the conditions for plant growth, in so far as climate affects them, are particularly favorable. In fact, in neither of the other major divisions of the United States—North or West—is there such a large area in which the climatic elements—rainfall, temperature, evaporation, humidity, and length of season, considered as a whole—approach the optimum that they do in the Southern States.

THE LEADING CROPS

Classification of the Crops.—The variety of crops grown in the South is great. For purposes of discussion we may divide the products associated with southern agriculture into four large groups:

1. *Crops grown for the early markets of the North.*—In this group are included garden truck, strawberries, bush fruits, and peaches.

2. *Crops that are better adapted climatically to the Northern States but are grown in the South largely as supply crops and rarely on a commercial scale.*—In this group may be placed corn, wheat, oats, barley, hay and forage, apples, and also the products of the live stock industry.

3. *Crops, such as tobacco, which have a wide range of distribution, that grow in a belt or zone that overlaps both North and South but have their greatest areal extent in the Southern States.*

4. *Crops distinctly southern in their distribution, such as cotton, sugar cane, rice, peanuts, pecans, and citrus fruits.*—California, because of its southern location and its mountain-rimmed valleys, produces all of these, but in none except citrus fruit does it approach the South in quantity.

THE FIRST GROUP OF CROPS

Early Vegetables.—The early advent of spring, the rapid warming of the light, well-drained soil of the Coastal Plain, the short season needed for the development of vegetables and small fruits, rapid transportation, and refrigeration enable the southern producers to monopolize northern markets before northern competition begins, and this is for about six months of the year.[2] Early in January, even before New York and other northern cities have experienced their coldest weather, southern Florida and the Texas Coastal Plain near the Mexican border begin their shipment of quick-maturing cool-weather vegetables. For ten to thirty days they enjoy the monopoly, and the New York City housewives pay fancy prices for a handful of radishes, onions, lettuce, or peas that has

[2] Vegetables "grown for home use" are not considered in this discussion.

made a 1000- or 1200-mile journey in a refrigerator car. (Fig. 147.) The monopoly is not complete, however, for the high prices that vegetables command at this time of year in northern markets has stimulated many northern gardeners to produce hot-house lettuce, spinach, and a few other vegetables that call for only a small space to grow successfully.

By late January and early February, northern Florida and perhaps southern Georgia, if a January or February " cold spell " has not delayed growth or killed the plants outright, usurps control, supplanting the regions to the south, for freight charges to markets are less. As the

Courtesy Tampa Chamber of Commerce.

Fig. 147.—Picking String Beans for Northern Markets Near Tampa, Florida.
The growing season here is nearly twelve months. Four crops of vegetables a year are possible.

season advances farther northward, the Savannah-Charleston regions, next the Wilmington, the lower Chesapeake, and finally the upper Chesapeake and Delaware Bay areas, each in turn has the monopoly, for a brief period, until northern New Jersey and Long Island assume control.

The centers of production of early vegetables in the South are southern and north central Florida, south central Mississippi, southern Louisiana, Savannah, Charleston, the coastal plain of Virginia, Maryland, and Delaware. Railroad and fast steamship lines to large northern cities have an important influence in the localization of trucking areas for early vegetables. The Illinois Central, The Southern Railroad, and the Atlantic Coast Line carry the bulk of fruit and vegetables to the North.

The Effect of Soil on Time of Maturing.—All the early vegetables are raised on the well-drained, light, warm dry sands. These soils are not fertile and, unless fertilized heavily, produce a poor quality of vegetable that is likely to deteriorate in shipment, yet the rapidity of growth on these soils offsets these adverse factors. The relation of latitude and quality and character of soil to market period is shown in Table XI.

TABLE XI

MARKET PERIODS FOR FRESH VEGETABLES

	Jan 15–31	Feb. 1–15	Feb. 15–28	Mar. 1–15	Mar. 15–31	Apr. 1–15
Florida and Georgia...	Sand	Fine Sand	Sandy Loam	Fine Loamy Sand	Loam	Silt Loam
South Carolina.......		Sand	Fine Sand	Sandy Loam	Fine Sandy Loam	Loam
North Carolina.			Sand	Fine Sand	Sandy Loam	Fine Sandy Loam
Virginia.				Sand	Fine Sand	Sandy Loam
Maryland and Delaware					Sand	Fine Sand
Long Island...... .. .						Sand

*Bulletin 96 U. S. Bureau of Soils.

Each of the regions named in the table enjoys a monopoly of northern markets for ten to fifteen days, for vegetables grown on the same types of soil.

Texas, Louisiana, and Mississippi hold the monopoly of the city markets of the North Central States longer than do truck-garden regions on the Atlantic Coastal Plain, because there is little competition offered by the states between the North Central markets and the Gulf Coastal Plains.

The raising of truck products for early markets is a precarious venture for the Coastal Plain gardener, for the period of market control on which success depends is brief, and local cold spells or heavy rains may so delay the period of maturing that regions to the north, if not so affected, may capture the markets. Markets are frequently glutted. The cost of production is high, and the yield of the earliest vegetables, which must be grown on the light, warm, sandy soils, is low unless large quantities of fertilizer are used. The money returns vary greatly; some years large sums are made, other years many face seeming failure; but, as in treasure hunting, no one knows when success may come, and hence the gardeners stick to the hoe. The cities of the South offer a market for both early and late vegetables, but their aggregate population is not large.

The Rank of the South in Vegetable Growing.—In number of acres used in the growing of vegetables offered for sale, exclusive of potatoes,

the South Atlantic States (in 1919) led all other sections, chiefly because of the large area of the Coastal Plain included in this division and the long time each year during which the truck gardeners dominate northern markets. The census data do not distinguish early vegetables from late. We know, however, that in spite of the high prices paid for early vegetables, the total production of late vegetables, measured in dollars, is far greater than that of the early, for summer is the chief vegetable-eating season. In the value of vegetables raised for sale the South Atlantic section stood second, the Middle Atlantic States leading. (Fig. 74.)

In comparing individual states, not one of the Southern States except Maryland, can be classed, as census data show, among the leaders in vegetable production, although it is claimed that from some states 250,000 carloads are shipped each year. California leads the states of the Union in acreage devoted to vegetables, followed by New York, Maryland, New Jersey, Iowa, and Wisconsin. Florida, the most important of Southern States, has ninth place, Texas thirteenth, and Virginia fourteenth.

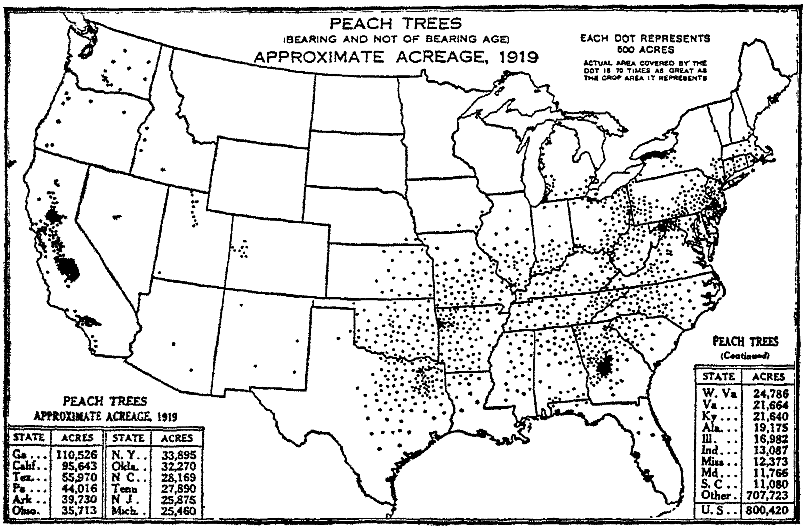
There were few vegetables raised for early markets in the South prior to 1865, and few small fruits and nursery products, because the population was scarce. There were no large southern cities to serve as markets, and labor was needed for cotton, rice, and corn. Furthermore, Negro labor was not intelligent enough, and transportation was so poor that markets in large cities could not be reached. The value of vegetables and fruits as foods was not appreciated, and refrigeration was unknown until 1875. In late decades there has been great development in truck gardening and in the number of varieties of vegetables. In the areas producing commercial vegetables, commercial varieties, which will stand shipping and look well at the end of the journey, dominate. In many sections a variety of truck is raised, for there is less chance for failure; yet certain of the areas have found it profitable to specialize.

Climate and soil are favorable factors in truck gardening, but the great distance to the Northern markets for early vegetables, the small urban population in the South, and the low per capita consumption in the South limit the industry.

Strawberry Growing.—Strawberry growers in the South who seek early northern markets have many of the difficulties of the truck gardeners. The annual production (based on 1919 data) in the South is about 60,000,000 quarts. The whole North produced about 92,000,000 in 1919. The leading strawberry areas of the South are near Norfolk, Va., in southern North Carolina, western Tennessee, and eastern Louisiana. Tennessee is the leading Southern State, and in fact the leading state of the Union in production and shipment.

Peach Growing in the South.—It is in Georgia, Arkansas, northeastern Texas, and central Oklahoma that most of the peaches of the South are raised. These and several minor regions have about 63 per cent of the bearing peach trees of the country and produce nearly 43 per cent of the total output. California alone, however, produces about 31 per cent (1919) of the total for the United States. (Fig. 148.)

Even when the Spaniards held Florida, there were large peach orchards in that state and elsewhere in the South. It was from these orchards that stock was secured for the peach orchards found on a large



PEACH TREES
APPROXIMATE ACREAGE, 1919

STATE	ACRES	STATE	ACRES
Ga. . .	110,526	N. Y. .	33,895
Calif. .	95,643	Okla. .	32,270
Tex. . .	55,970	N. C. .	28,169
Pa. . .	44,016	Tenn	27,890
Ark . .	39,730	N. J.	25,875
Ohio.	35,713	Mich. .	25,460

PEACH TREES
(Continued)

STATE	ACRES
W. Va	24,786
Va . . .	21,664
Ky . . .	21,640
Ala. . .	19,175
Ill. . .	16,982
Ind. . .	13,087
Miss . .	12,373
Md. . .	11,766
S. C. .	11,080
Other .	707,723
U. S. .	800,420

Courtesy U. S. Department of Agriculture.

FIG. 148.

Although peach orchards are widely distributed in humid United States south of the latitude of the Lakes Region, it is only in a few localities that peaches are grown on a commercial scale. Georgia has more acres than California but the latter produces more bushels of peaches than the former.

number of southern plantations until after the Civil War. Careful selection and favorable soil and climate have preserved or even enhanced the color and flavor of the Spanish variety. It is still a favorite.

About 1870–75 the first attempts were made to place Georgia peaches on northern markets; but this was before the days of special fruit trains, refrigerator cars, and scientific methods of packing. Many experiments were tried, but almost always the reports to the shipper were the same, "spoiled in transit." Finally the refrigerator car solved the problem, and in 1889 the first large peach crop was successfully marketed. The planting of peach orchards soon became active in many

parts of Georgia. Many failures resulted through lack of knowledge of air drainage, adaptation to soil, and adaptation of variety to conditions. Experience has taught that the hill slopes in northwestern Georgia in the Great Appalachian Valley are suitable, and here is found a large acreage; but the leading peach region has come to be central Georgia, to the southwest of Macon, centering about Fort Valley and Marshallville. The towns Fort Valley and Marshallville are on broad interstream uplands with plenty of slope.

Peach growing in the South is not without its losses. On the average, one crop out of three or four is lost by late frosts. The warm days of late February and early March may start spring growth in the trees in central Georgia and Texas—slightly later farther north—while late killing frosts may come as late as April 1. Because of the long budding and blossoming season, many blossoms or buds usually escape the one or two days of cold weather, and enough peaches will mature to make a paying crop. In comparison with California, the yield per tree is low. Georgia has nearly as many bearing trees as California, yet the yield is less than one-third as many bushels. The yield per tree, however, in Georgia is higher than in most of the northern states. There are, of course, factors other than geographic ones that influence the output of orchards. The Georgia Fruit Exchange, with agents in nearly 250 cities, and the active cooperation of the railroads assist the producers in getting their product on the markets at opportune times. About 85 per cent of the peach growers belong to the exchange.

The Second Group of Products

Little need be said about the second group of products, for a discussion of these belongs properly in the sections devoted to the Northern States. Any of the cereals will grow over a large part of the South. Barley and oats are sown for winter cover crops and pasturage and for plowing under. Wheat, confined chiefly to the Upper South, is ground in local mills, mainly for local consumption. Corn is widely distributed, cornfields being found in every part except in the Lower Mississippi delta, east Gulf regions, and most of Florida. Yet Illinois and Iowa together in 1919 produced a million more bushels than the entire South. Much corn is consumed as human food, the per capita being much greater than in the North; but because of the relatively slight importance of live stock in southern agriculture there is not the demand for corn that there is in the Corn Belt. The South has a large area in which the climate is nearly as good, if not as good, as in the North. Some of the largest " corn club " yields have been produced in the South which leads

one to venture the opinion that with better tillage and attention to seed selection the returns may be greatly increased. The heavy rainfall and high temperatures tend to develop more stalk and leaf than in the North, and often this growth is at the expense of the kernels.

Apples have long been grown in the South, but only since about 1860 have commercial orchards been planted. Planting is still in progress. The chief producing orchards are on the ridges of the Appalachian Valley, the Blue Ridge in Virginia, Southern Appalachian Mountains in North Carolina, and the Ozark Plateau in northwestern Arkansas. The apple-growing regions of the United States do not extend southward much beyond the middle South. About one-third of the bearing apple trees in the country are in the South, but the total production is only about one-fifth (in 1919) of the total.

Southern Live Stock Industry.—Even to-day the South ranks well among the other sections of the United States in the live stock industry, the value of southern live stock being about 28 per cent of the total for the country. Little attention has been paid to the raising of blooded or special-purpose stock until the last decade or two, although a few planters have all along raised pedigreed horses and cattle. Kentucky and Tennessee have long bred race horses. In the early part of the nineteenth century, Devon and Shorthorn cattle were brought from England, but in most parts they were crossed with other breeds. Strains of these may still be seen among the "scrubs" in some sections.

The raising of cattle has been easy, and until recently little attention has been given to the maintenance of quality. Since earliest Colonial times it has been the general practice to turn cattle, and hogs, also, free to range the forests for a living. In Colonial times they were not herded, as in New England by public herders, but were "branded" and allowed free range, and once a year "round-ups" were held and the increase allocated. The loss of cattle was considerable. Flint writes that in pre-Revolutionary War days the planters expected that such "multitudes" would die each winter as to "supply hides enough for shoeing the Negroes on every farm." This was a matter "generally and constantly anticipated."

Nature developed two distinct varieties of cattle in the South, the Texas "longhorns" and the "piney woods" cattle. With them may be classed the "razor back" hog. They do not conform to man's ideals of special-purpose animals, but are not to be classed as degenerates. They are the product of Nature's breeding. All "pure-bred stock" needs the watchful care of man. These so-called "scrubs" will thrive better in their environment than the pampered products of man's careful selection.

The days of the so-called "scrubs" in the South are numbered.

The "longhorns," some with a spread of horns of eight feet or more, practically all disappeared[3] by 1885. There are still large herds of "piney woods" cattle and a few "razor back" hogs;[4] but commercial clubs, chambers of commerce, banks, railroads, state agricultural colleges, county agents, and farm journals have educated the southern farmer to the value of blooded stock. Only a beginning has been made, however. In 1920 the South had about 17 per cent of the blooded cattle of the country. The first public sale of pure-bred cattle in the South was held in Oklahoma City in 1903 and the second sale in 1904 at Auburn, Ala. During the last five years a score or more have been held each year. The South lacks packing houses, but a beginning has been made at Fort Worth, Nashville, Macon, and elsewhere. Creameries, condenseries, and cheese factories are becoming more numerous. The long grazing season, large area for cattle ranges on the cut-over lands of Coastal Plains and mountain slopes, and the abundance of the more concentrated foods, as cottonseed and peanut meal, ensilage, and leguminous plants, are conditions that will not long be overlooked. The tick, the most important barrier in the past, is now about eradicated.

THE THIRD GROUP OF CROPS

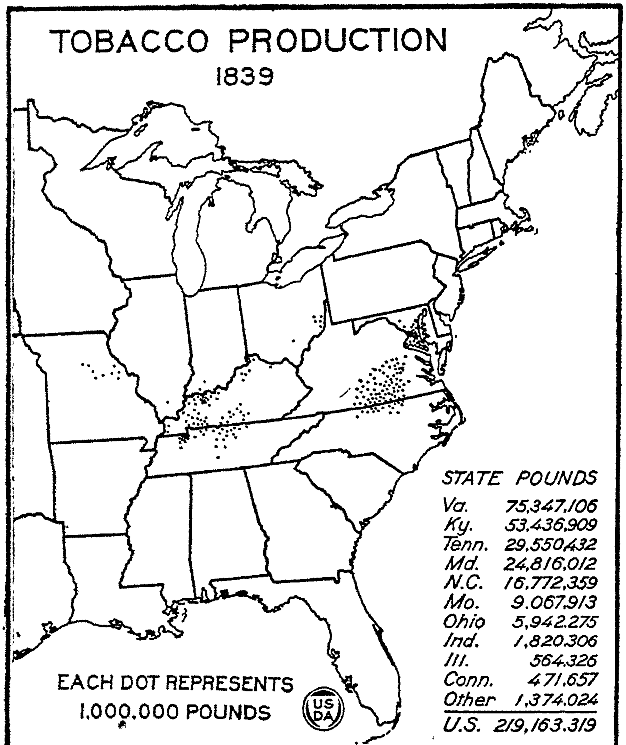
Tobacco in the South.—Tobacco, a product common to both the Northern and Southern States, is, after all, a southern crop. Nearly 90 per cent of the product of the country comes from the South, and Kentucky alone produces nearly twice as much as all the Northern States combined. The yield per acre in pounds (five-year average for 1918–22, inclusive) is on the average only about 50–70 per cent of that in the Northern States.

Like corn, tobacco is a gift of the first Americans to our European ancestors who colonized this continent. At one time, tobacco raising at Jamestown was so profitable that the borders of the streets were planted and the production of food crops neglected. From the Chesapeake Bay region tobacco culture was carried southward and westward. It was finally found that the best environment for the plant is in northern and western Kentucky; southern Virginia on the Piedmont; northern North Carolina, both Piedmont and Coastal Plain; and eastern South Carolina, chiefly on the Coastal Plain. These are the more important tobacco-growing centers of the United States. (Figs. 149–152.)

[3] A preserve is now being provided in southwestern Oklahoma for longhorn Texas cattle.

[4] "Round-ups" of both cattle and pigs are still held in the cut-over regions of the Coastal Plain in some states.

At present, tobacco is a product chiefly of the small farm, and only a few acres on a farm are devoted to it. Its culture on many farms is a family affair, and one family of average size is able to raise 5–10 acres. In Kentucky and North Carolina, the average size of the patches is less than 5 acres. On some of the large farms where labor is employed for general agriculture, the tobacco fields often have 20–30 acres per farm.



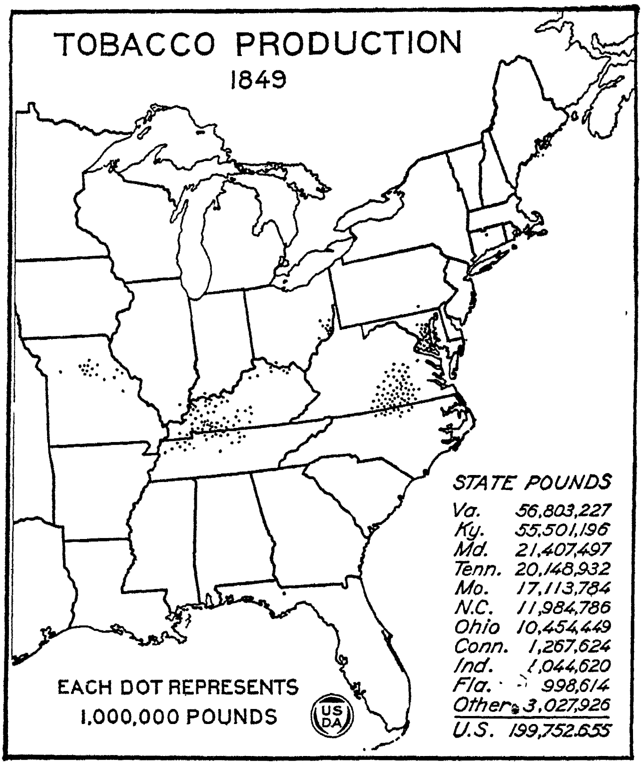
Courtesy U. S. Department of Agriculture.

Fig. 149.

The Fourth Group of Crops

Cotton, the Most Important Crop.—Cotton was found by the early Spanish explorers in many parts of America—in the West Indies, Mexico, Central America, and Peru—and in all these sections it was being used by the Indians in the manufacture of cloth. The West Indies is probably the chief source of the cotton seeds introduced into southeastern North America. The history of cotton is intermingled with that of the South from the earliest Colonial period. It was experimented with in Virginia about 1608, and was early spoken of as a promising crop. By

1621 it was listed as one of the export crops of the colony, but we have no data to tell how much was shipped. In the colonies to the south of Virginia, cotton was always among the first crops attempted. When the Revolutionary War cut off the supply of English cotton goods, efforts were made in America to increase production and to manufacture cloth. By this time the revolutionary inventions in the textile industry had already

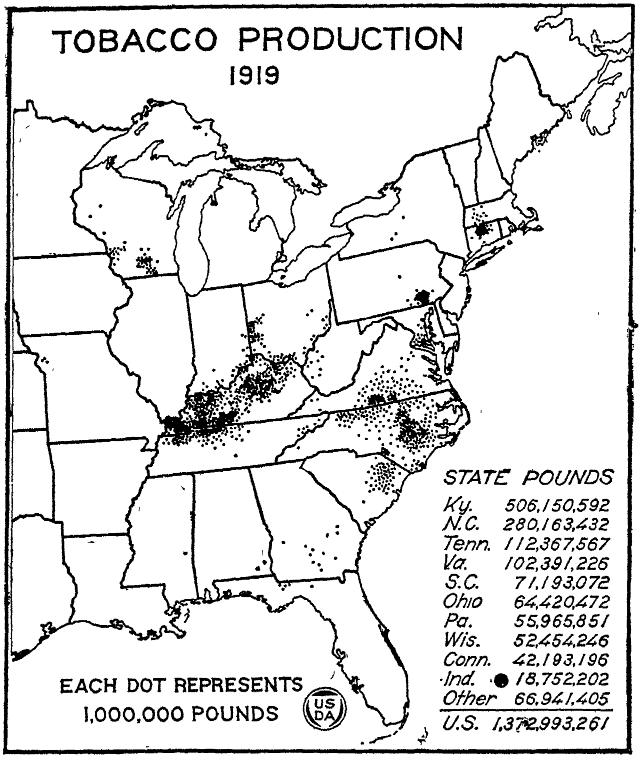


Courtesy U. S. Department of Agriculture.

FIG. 150.

been made and England at the close of the war was able to supply cheaper cotton goods than ever before. The expansion of the textile industry in England and of cotton raising in America was retarded by the great amount of labor needed to separate seed and fiber. Sea island cotton had already been introduced into Georgia, and a crude roller gin had been devised—exactly like the *churka* used in India for many centuries—which worked well with this long staple. But long-staple sea island cotton was very limited in amount. The Whitney gin invented in 1793, and the improvement added by Holmes—saws instead of spikes on rollers—solved the

by the cotton factories of England came from America. The dangers of depending solely on one country for a product that supplied work for hundreds of thousands of people became evident in England shortly after the beginning of the Civil War; and when the danger was realized a conference was called and stock taken of the possible cotton lands in the world outside the United States. The results were most gratifying;



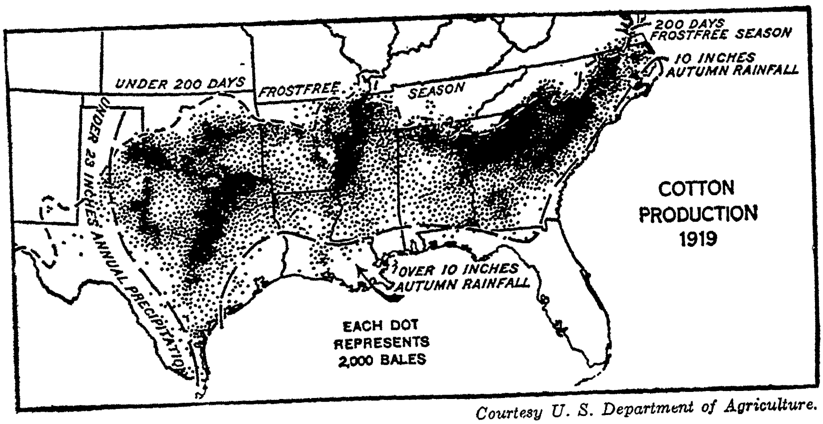
Courtesy U. S. Department of Agriculture.

Fig. 152.

A comparison of Figs. 149 to 152 shows graphically the increasing importance of the South as a tobacco producing region and the shift of the center from the Atlantic Slope to the Kentucky–Tennessee region. The tables give excellent data for graphs. Note that the time intervals are not the same. In drawing curves this must be considered. Work out a discussion of the shift of tobacco culture, illustrating your findings by curves and graphs.

more than thirty countries could produce cotton. There were prospects, therefore, that never again would England have to depend exclusively on America; but when the Civil War was over the South again got into production. Its geographic superiority in the growing of cheap high-grade cotton insures it the monopoly. In no other section of the world is there such a large area suitable for the growing of cotton: favorable

climate, excellent transportation facilities, good labor and intelligent supervision, large invested capital, and well-established traditions and practices. (Figs. 153, 154, and 156.) America could produce many times as much as it does now if there were markets to absorb the production. There are probably more than 300,000,000 acres in the Cotton Belt, but in most late years less than 40,000,000 acres have been devoted to its culture. Other sections of the world may cut in on the southern monopoly, but the South is likely to remain dominant in this great textile staple. (Fig. 155.) Should some of the European textile countries become independent of American raw cotton, they would meet



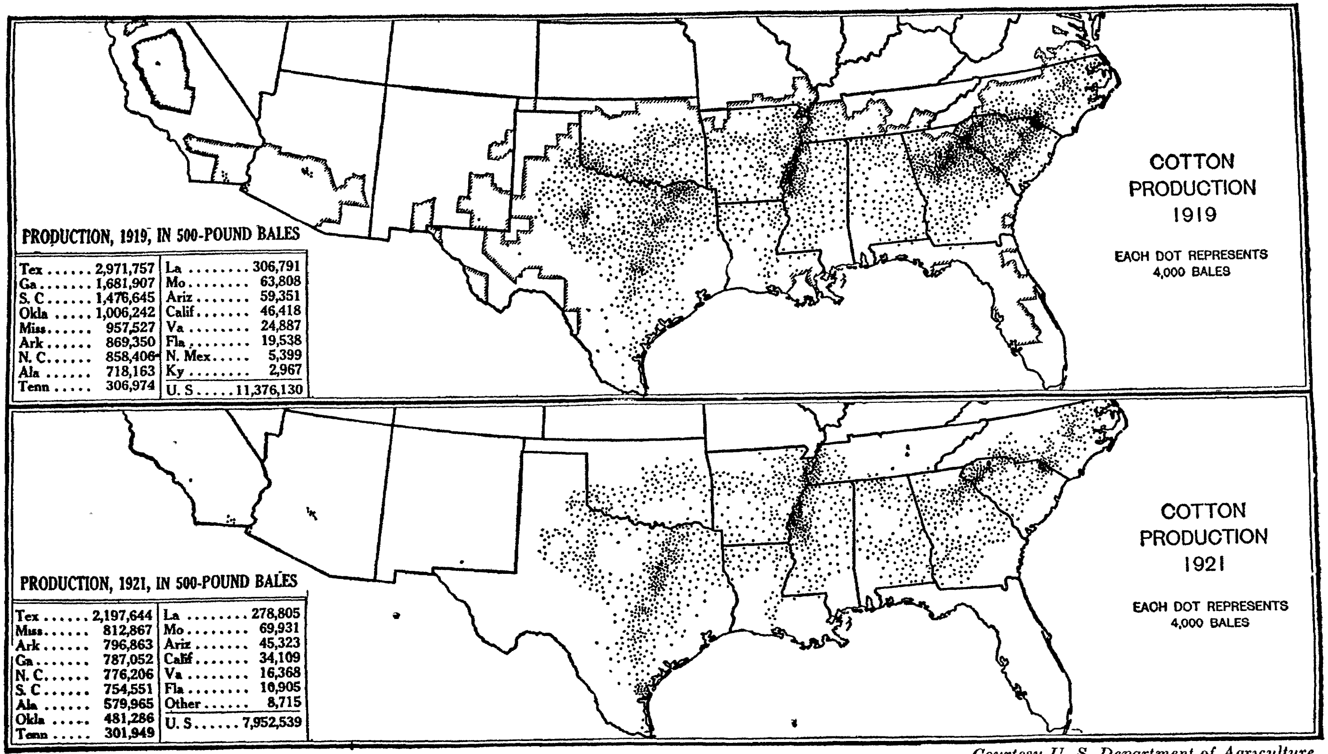
Courtesy U. S. Department of Agriculture.

FIG. 153.—The Relation of Climate to Cotton Production.

What conclusions do you draw? Compare the effectiveness of this map with Fig. 154 in showing the distribution of cotton production.

in the markets of the world the competition of the American mills using American raw cotton.

The Rice Crop.—The native home of rice for thousands of years has been eastern and southeastern Asia, where the summer temperatures are high and the rainfall heavy. In the United States a similar environment, except that the season is not quite so long, is found along our Gulf and South Atlantic Coast and in the alluvial valley of the Arkansas and Mississippi. In 1919 the leading states in rice production were Louisiana, producing 16,000,000 bushels; Arkansas, 6,800,000, and Texas, 5,300,000. South Carolina, Georgia, and a few other states of the South produced small quantities. The rice crop of the United States in 1919 was worth $100,000,000, but the five-year average (1918–22) was only about $60,000,000. In 1921 it was only $34,800,000. About 80 per cent of the average of the production comes from the South. California is the only other state of importance, outside of the South.



PRODUCTION, 1919, IN 500-POUND BALES

Tex	2,971,757	La	306,791
Ga	1,681,907	Mo	63,808
S. C	1,476,645	Ariz	59,351
Okla	1,006,242	Calif	46,418
Miss	957,527	Va	24,887
Ark	869,350	Fla	19,538
N. C	858,406	N. Mex	5,399
Ala	718,163	Ky	2,967
Tenn	306,974	U. S	11,376,130

PRODUCTION, 1921, IN 500-POUND BALES

Tex	2,197,644	La	278,805
Miss	812,867	Mo	69,931
Ark	796,863	Ariz	45,323
Ga	787,052	Calif	34,109
N. C	776,206	Va	16,368
S. C	754,551	Fla	10,905
Ala	579,965	Other	8,715
Okla	481,286	U. S	7,952,539
Tenn	301,949		

Courtesy U. S. Department of Agriculture.

FIG. 154.—The Shift of Cotton Production.

Many factors are responsible for this shift—cotton boll weevil, climatic variations, competition with other crops, new crops and new types of agriculture, and many others.

There are possibly 20,000,000 acres in our country that may be devoted to rice culture. Only about 1,000,000 are being used, the low per capita consumption in the United States being the chief reason for the low acreage. British India has on the average 70,000,000 acres in rice each year, and the average crop is 60–75 billion pounds. The total for the United States is less than one billion. The culture of rice in the South reached its highest perfection, up to the time of the Civil War, in 1850 when nearly 290,000,000 pounds were grown: 150,000,000 in South Carolina, 139,000,000 in Georgia. Carolina rice had a good reputation in Europe. One author, in London, wrote, "By far the best imported rice is from South Carolina. It is larger and better tasting than that from India, which is small, meager, and often broken." The cultivation of rice, raised by the help of slave labor, brought great prosperity. Men grew rich, built fine homes, and educated their children, from the fields of rice. Rice growers were the leading agriculturists of the South in the use of scientific methods —rotation of crops and the use of fertilizer.

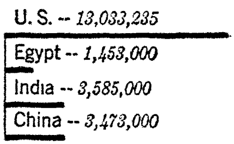
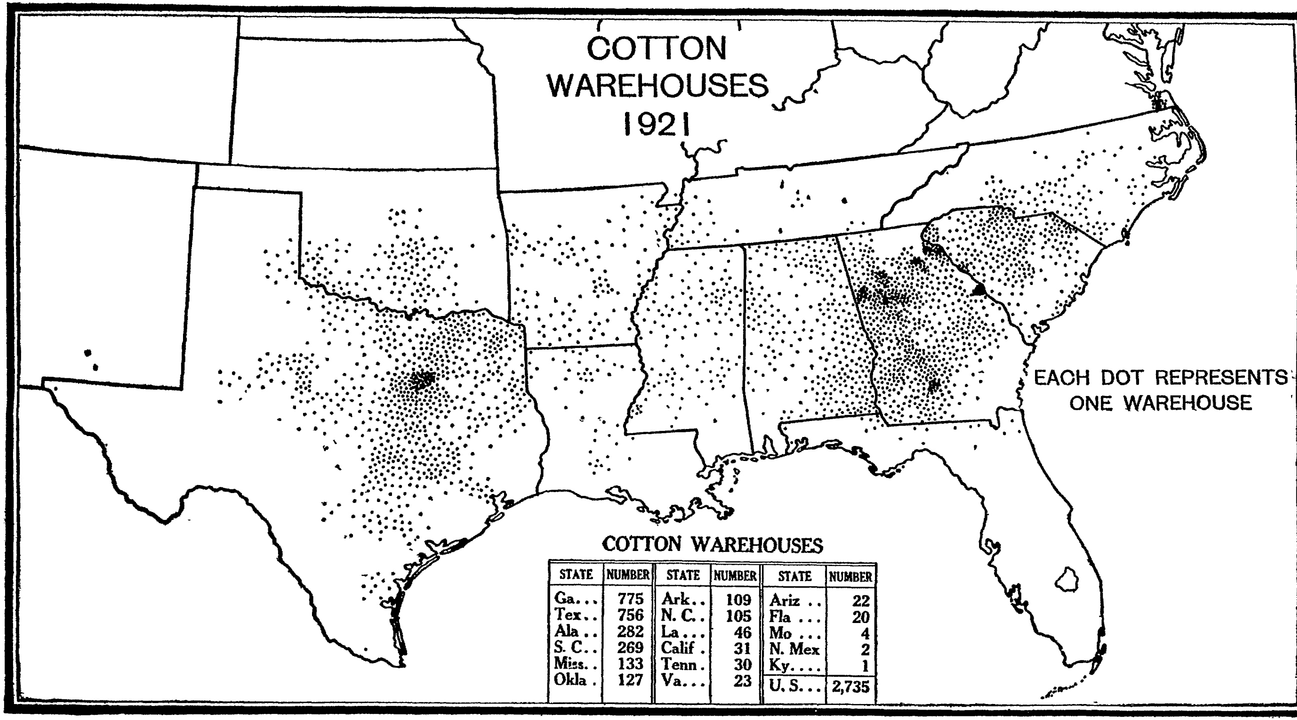


FIG. 155.—Cotton Production by Countries (1909–1913).

During the Civil War the industry was almost destroyed. The canals became filled with swampy vegetation, the fields were neglected, and the planters emigrated to the interior. In 1890 the growing of rice was reëstablished in South Carolina and Georgia, but by that time it had begun to be grown in the west Gulf lands by irrigation methods. In 1879 South Carolina produced 1,873,000 bushels; Georgia, 900,000; and Louisiana, 800,000. By 1889 Louisiana took the lead, the crop being 2,700,000 and that of South Carolina but 1,000,000 bushels. By 1909 rice growing in the South Atlantic States was of little importance. (Figs. 157–159.)

Rice culture in Louisiana and Texas is much like wheat culture in the grain states of the North. It was the application of grain machinery to rice culture, by farmers from the Middle Northwest in the eighties of the past century, that made the growing of this Oriental cereal on a large scale possible. Here one finds irrigation practiced in a region where the rainfall is sufficient for other humid-land crops. The water is pumped from the bayous or wells, or furnished by flowing wells, and distributed over the land, much as it is in the arid sections of the West. The flatness of the Coastal Prairies, the great depth of soil, and its looseness made the construction of distributing channels easy. Low levees are, as a rule, thrown up about the borders of the patches of ground, suf-



STATE	NUMBER	STATE	NUMBER	STATE	NUMBER
Ga. . .	775	Ark. .	109	Ariz . .	22
Tex. .	756	N. C. .	105	Fla . . .	20
Ala . .	282	La . . .	46	Mo . . .	4
S. C. .	269	Calif .	31	N. Mex	2
Miss. .	133	Tenn .	30	Ky. . . .	1
Okla .	127	Va. . .	23	U. S. . .	2,735

Courtesy U. S. Department of Agriculture.

FIG. 156.

The warehouse reduces "country damage" (damage done in the field) to cotton, protects the cotton from theft, and enables the owner to secure loans at the bank on his crop as soon as it is stored. In a few states, as Alabama, Mississippi, Arkansas, and Oklahoma the farmers sell their cotton soon after it is picked, and hence there is little demand for warehouses.

ficiently high to hold the waters yet low enough to permit the free movement of farm machinery over them.

The lands are plowed and harrowed and the seed is drilled in by the ordinary grain drills used in grain fields. After the small plants reach

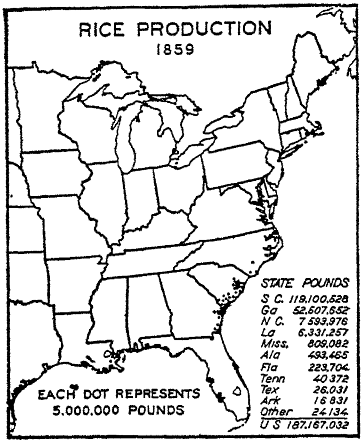


Fig. 157.

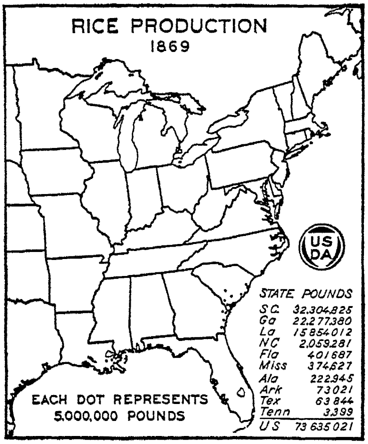
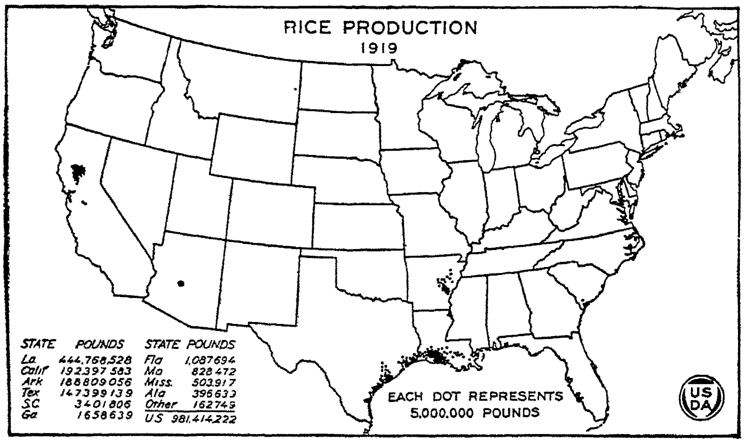


Fig. 158.

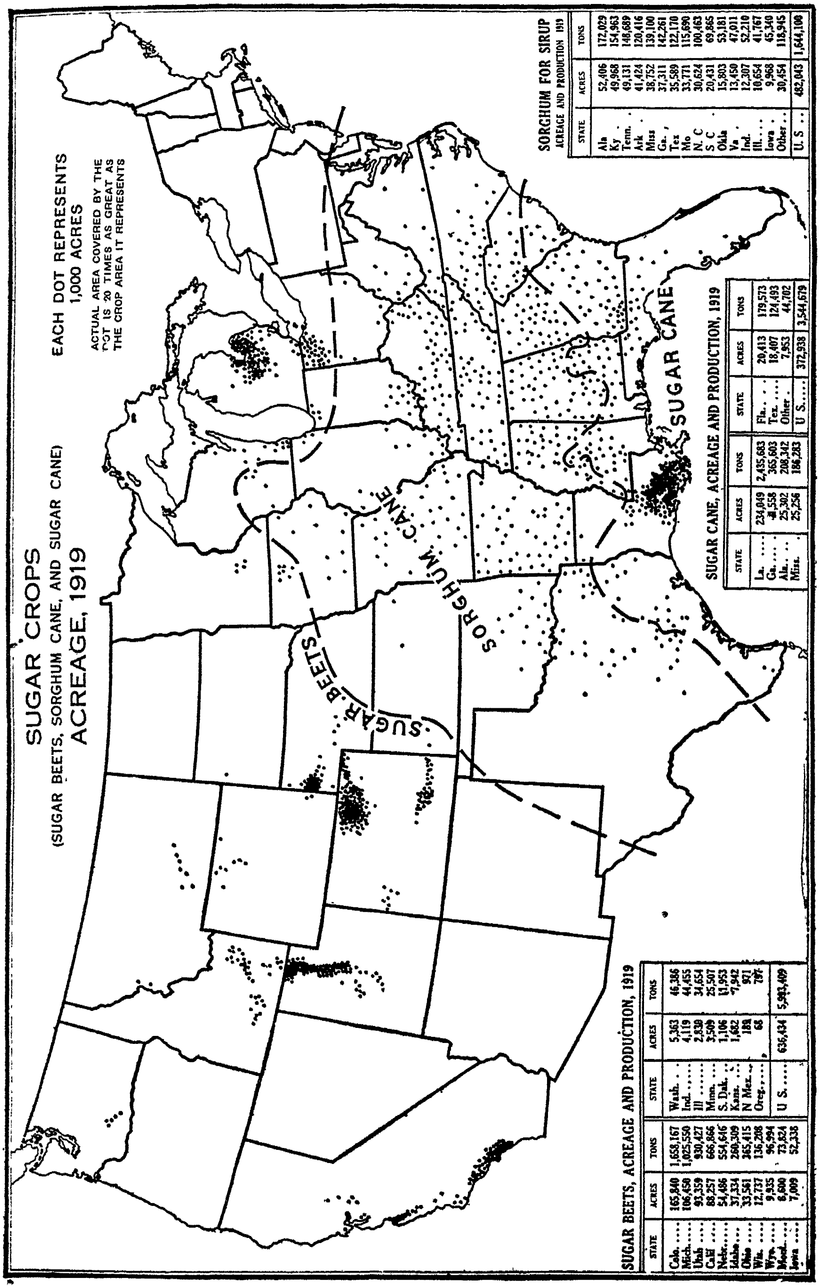


Courtesy U. S. Department of Agriculture.

Fig. 159.—The Migration of Rice Production.

In 1859 the South Atlantic States led. The Civil War nearly destroyed the industry and by 1869 there was only a slight revival. In the 80's rice culture got an active start in Louisiana.

the height of an inch or two, the fields are flooded and kept flooded throughout the greater part of the growing season. When the heads of rice are nearly fully formed, the fields are drained and allowed to dry out. This decrease in moisture hastens the maturing of the seed and gives a



SUGAR BEETS, ACREAGE AND PRODUCTION, 1919

STATE	ACRES	TONS	STATE	ACRES	TONS
Colo.	165,840	1,658,167	Wash. . .	5,363	46,386
Mich.	106,450	1,025,550	Ind.	4,119	44,455
Utah	93,359	930,427	Ill	2,830	34,654
Calif	88,257	666,866	Minn. ...	3,509	25,507
Nebr.	54,486	554,646	S. Dak. ..	1,106	11,953
Idaho ...	37,334	260,309	Kans. ...	1,682	7,942
Ohio	33,561	365,415	N Mex. ..	189	971
Wis.	12,737	136,208	Oreg.	68	797
Wyo.	9,935	96,994			
Mont.	8,600	73,824	U S.	636,434	5,983,409
Iowa	7,009	52,338			

SUGAR CANE, ACREAGE AND PRODUCTION, 1919

STATE	ACRES	TONS	STATE	ACRES	TONS
La.	234,049	2,435,683	Fla. . . .	20,413	179,573
Ga.	41,558	365,603	Tex.	18,407	124,493
Ala.	25,302	208,342	Other .	7,953	44,702
Miss. .	25,256	186,283	U S.	372,938	3,544,679

SORGHUM FOR SIRUP
ACREAGE AND PRODUCTION 1919

STATE	ACRES	TONS
Ala	52,406	172,029
Ky .	49,968	154,963
Tenn. .	49,131	148,689
Ark .	41,424	120,416
Miss	38,752	139,100
Ga. ,	37,311	142,261
Tex	35,589	122,170
Mo	33,771	115,690
N. C	30,624	100,463
S C .	20,431	69,865
Okla	15,803	53,181
Va .	13,450	47,011
Ind.	12,307	52,210
Ill. ...	10,654	41,767
Iowa .	9,968	45,340
Other . .	30,454	118,945
U. S . .	482,043	1,644,100

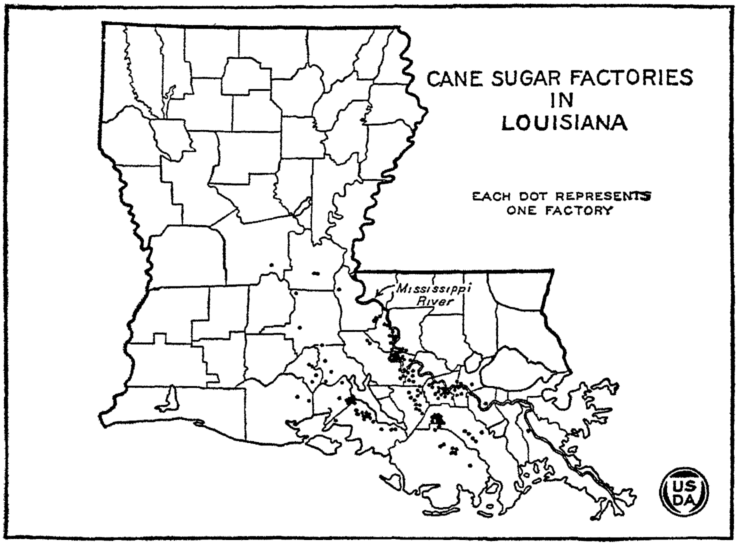
Courtesy U. S. Department of Agriculture.

Fig. 160.

Commercial sugar cane growing hardly exists in the South outside the "sugar bowl" of Louisiana. Sorghum cane is grown mostly for sorghum syrup. The annual production of sugar made from sugar beets varies from about 700,000 short tons to more than 1,000,000, from sugar cane from 140,000 short tons to 350,000 tons or more.

firm bed for the heavy binders which harvest the crop. In September and October when the harvesting and threshing season is on, the rice farms remind one of the wheat lands of the North Central States, with binders, rice stack, and threshing machines, except that Negro labor is doing most of the work.

Rice culture gives origin to a small industry in rice cleaning and polishing. There are in the United States 86 small establishments for the preparation of rice for market, employing 20–40 laborers each on the average. More than 70 of these are in the Southern States.



Courtesy U. S. Department of Agriculture.

FIG. 161.

Most of the factories are on the *newer* delta lands of the Mississippi and the prairies. Each factory is central to the cane producing lands.

Sugar in Louisiana.—Although sugar cane is grown for sugar in eight of the Southern States, Louisiana produces about two-thirds of the total for the country and, but for the tariff barrier to tropical sugar, the industry could not exist. It is a crop that does its best only in the tropics and must be produced on a large scale, for the mills used in its manufacture, if they are to produce sugar low enough to meet the keen competition, are necessarily large and costly. (Fig. 160.) All through the lower South, however, sugar is grown on tens of thousands of farms in each state—271,000 in all—merely for the making of sugar and syrup for home consumption. It is only in Louisiana that it is grown for commerce. (Fig. 161.)

Little can be promised as to the growth of the sugar industry in the South owing to the many unfavorable conditions to be overcome by southern cane-growers, such as adverse climate, labor scarcity, and changing tariff. There is so much good, free land in the tropics, and the yield is so much better there, that the industry in the South will probably last only as long as it is encouraged by favorable tariff laws.

Citrus Fruits.—There is a large area along the Gulf Coast stretching from the Rio Grande to Pensacola that is adapted to the growing of oranges, but only a small part of this region is utilized. Most of the

Courtesy of Tampa Chamber of Commerce.

FIG. 162.—An Orange Grove Near Tampa, Florida.

Orange trees were probably first introduced by the Spaniards. The fruit of these trees was bitter. In the last century these Spanish or Seville orange trees were largely used as stock on which sweet orange buds were grafted. Florida oranges began to seek northern markets about 1885. Florida oranges are heavier than those of California but to many they lack the flavor of the Pacific Coast product.

orange groves are in Florida, south of 29° N. (Fig. 162.) It is believed that the Spaniards brought the bitter Seville orange from Europe when they occupied the eastern Gulf Coast regions. Some of these trees have been used as stock for grafting. The modern orange-growing industry dates from about 1875, when the East Coast Railway was completed. At one time Florida dominated northern and eastern orange markets, but severe freezes in 1886, 1894, and 1899 destroyed three-fourths of the plantings and thus gave California an opportunity to win markets. Replanting

followed in Florida, but not in the northern portion of the state. The orange region was shifted southward. Florida now produces only about 36 per cent as many boxes, and their value is less than 24 per cent of the California crop. The lower yield and value are undoubtedly due chiefly to poor methods of production and marketing. Only in the last decade or two has a Florida fruit exchange done much advertising. In some markets in the eastern United States, Florida oranges compete successfully with the California product because they can be put on the market at a much lower price. They are sent a thousand miles or more by carload lots without boxing.

Grape fruit, or pomelo, grows in much the same region as the orange. In the production of this recent arrival on northern markets, Florida made the beginning and has since retained its leadership. About 85 per cent of the pomelo trees of the country are in Florida; and if proper attention is given to marketing and careful cultivation, Florida will continue to lead, for it has a great advantage over California, its only competitor, in distance and freight costs. California has a large market on the Pacific Coast and the West in general, but nothing like the one Florida can command.

Citrus fruit, after all, bulks small when compared with other agricultural products of the South. Oranges, grapefruit, limes, tangerines, kumquats, in the aggregate, were in 1919 valued at less than about $22,000,000, while the cotton crop, including seed, was worth more than $2,300,000,000.

QUESTIONS, EXERCISES, AND PROBLEMS

1. Some writers claim that the South offers excellent advantages to the home seeker in search of farm lands. Can you justify such claims? Make use of all the needed climatic, physical, and agricultural maps in the text.

2. Make a statistical comparison of agriculture in Mississippi and Iowa. Data may be secured from Vol. VI, Parts 1 and 2, Census Report, the Year Book of the Department of Agriculture for 1921, and the Statistical Abstract. Compare land areas, population, farm lands, improved farm lands, crops, live stock, automobiles on farms, water in houses, telephones, value of farm property, and of machinery, and other items on which you secure data. What are your conclusions? What explanations can you offer for the differences?

3. Select a county on the Coastal Plain of North Carolina (Greene County) one on the Piedmont (Guilford County), one in western North Carolina (Harwood County), and compare the agricultural conditions. Secure data from Vol. VI, Part 2, Census Report.

4. Make a statistical comparison of agriculture in a county in the Black Belt of Texas (Ellis or Dallas County) with a county in the black-earth section of Nebraska (Adams or Clay County). Write your conclusions.

5. Compare yields per acre of several crops grown in both North Central and

Southern States. What explanations do you offer? Secure data from the Year Book of the Department of Agriculture.

6. To what extent is the South improving its cattle, sheep, and swine by the introduction of pure-bred animals? Compare with some of the states of the North. Does the presence of a large number of Negro tenants have any influence on agricultural improvement?

7. How do you explain the tendency toward intensification in agriculture in some sections of the South with a population density as low as it is?

8. Classify the several Southern States as to location in the Agricultural Regions shown in Fig. 16.

9. What improvements in the methods and practices of agriculture would you suggest to make the South a greater agricultural section?

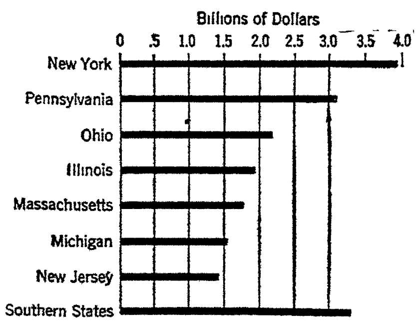
CHAPTER XV

MANUFACTURING IN THE SOUTH

INDUSTRIAL OPPORTUNITIES

Some Comparisons.—The value of the manufactured products of the South (sixteen Southern States as listed in the Census Report) in 1919 was nearly 90 per cent of the value of the output of the factories of the entire United States in 1889, and one and six-tenths times the entire output of the country in 1879. The capital invested in manufacturing in 1922 was nearly two and one-half times that invested in the entire country in 1879. The aggregate spindles in southern cotton mills in 1922 numbered 60 per cent more than those of the United States in 1879. The South produced more pig iron in 1919 than did the entire country in 1879, cut nearly as much lumber, mined twice as much coal, and produced seven times as much petroleum. From 1879 to 1919, the value of the manufactured products of the South increased from $339,000,000 to $8,375,000,000.

This is indeed remarkable progress in industrial development; yet other sections have grown likewise in these four decades. The fact is, the South is not producing its share of the manufactured goods of the United States, when relative areas and populations are considered. Although the South has nearly 30 per cent of the total area of the country and more than 30 per cent of the people, it produces (based on data for 1919) only 13.4 per cent of the manufactured goods of the country, and the value added by manufacture is but 13 per cent of that for the country as a whole. The Northeastern Region of the United States produces nearly three and one-fourth times as much; the North Central States nearly three times; and New York, the leading manufacturing state of the Union, more than all the South. (Fig. 163.) These comparisons



LEADING STATES IN MANUFACTURING. Value Added by Manufacture, 1919

FIG. 163.

bespeak a retarded development, past and present; yet the progress made in the past few decades offers great hope for the future. *What are the causes for the retarded condition? Should we be optimistic or pessimistic as to the future?*

Causes for Retarded Industrial Development

The Dominance of Agriculture.—The South traditionally is an agricultural section. At the last census more than half the farm population of the country resided in the South; and, as previously stated, 72 per cent of the people are classed as rural. In Colonial days there were here and there in the South, as in the Northern States, small industrial plants of various sorts built to cater to local needs only. As settlements spread westward along the small non-navigable streams, and especially beyond the mountains, there was a call for local industries, and these supplied all community needs until the coming of the railroad. Such was the condition over all parts of the South beyond the tidewater areas. Except for the invention of textile machinery in England and the cotton gin in America, it seems probable that there would have developed in time an industrial and commercial population along with an agricultural, in such relative numbers as to make each community, or natural trade region, self-sustaining in so far as local resources would permit.

Cotton Becomes King.—It was discovered, however, two or three decades after 1793, that great profits were to be made in the growing of cotton. Accordingly most of the available capital of the South went into land, farm buildings, tools, and slaves. Most industries, unless associated with cotton culture, languished. Before the middle of the century cotton production came to exceed the demand. Cotton prices reached such a low level that cotton culture lost some of its glamour. Some capitalists, for a few years at least, sought channels other than agriculture. Some thoughtful men came to realize the ill effects of the industrial dependence on New England and old England; they saw that it was bad economy to ship the raw products hundreds of miles to be fabricated, and to have the articles returned and purchased at several times the cost of the raw material, while capital and labor got such low returns in agricultural pursuits. Political antagonism toward the North made this commercial and economic vassaldom all the more galling. But what could be done? The basic economic activity of a country is not to be changed in a day, and agriculture was the dominant activity. The South in 1850 was producing only about 10 per cent of the manufactured goods of the country.

Effects of the Civil War.—During the Civil War, cut off from the factories of the North and Europe, every available plant in the South was at work producing clothing, food, munitions, railroad equipment, and other articles needed for war. The small factories scattered all over the South were expanded, and other plants built to take care of the emergency demand. By the close of the war, all these factories were idle or had been destroyed. But the South had its land, its abundant rain, genial temperatures, and life-giving sunshine, and it was these that largely came to save it. Its economic life for many decades was to be intimately associated with these enduring factors. It again became the producer of raw materials for northern and eastern factories. Its economic affiliations, as well as its political, were again merged with those of the country at large.

Coal and Railroads Give North Advantage.—In the two decades preceding 1870, coal for steam power had come to be an important factor in the industries in the Northeastern States. In 1850 the country at large used 6,250,000 tons of coal; by 1860 the consumption had reached more than 13,000,000 tons; and by 1870 nearly 30,000,000. Nearly all of this was consumed in the North, and a large part in northern factories, which gave this section a decided advantage in the production of manufactured articles. Moreover, railroad consolidation had progressed to such an extent by 1870 that northern manufactured goods had access to southern markets. With the absence of tariff barriers to check the influx of northern-made goods and to protect the young and feeble industries in the South, little progress in manufacturing was made. The trans-Rocky movement of population and capital, initiated by the discovery of gold in 1848 and wonderfully aided by the construction of the transcontinental railroad, was going on apace. In national development and industrial expansion, the South was forgotten by the North and Northeast, the sections best equipped to furnish capital. A few northern men, however, who had participated in the campaigns in the South, saw great possibilities here and returned at the close of the war with some capital.

In 1870 the factories of the South produced only 6.6 per cent of the manufactured goods of the country; in 1880, only 6.3 per cent; in 1890, 7.5 per cent; in 1900, 9.1 per cent; in 1910, 12.2 per cent; and, as stated earlier in the discussion, in 1920, 13.4 per cent. Thus, at no period in its history has the South produced the portion of the manufactured goods of the country that its area and population call for. Its past has been fundamentally associated with agriculture.

Effects of Low Population Density.—Another cause for the retarded development is the low population density. It is a well-known prin-

ciple that the occupations dominant in a country bear a fairly definite relation to the density of population. The countries or sections of countries dominantly manufacturing have high population densities. Belgium as a whole has a population density of more than 670 to the square mile; England and Wales, about 620; Massachusetts, 479. New York (state), with fully 90 per cent of its factories concentrated in a narrow strip along the Hudson and Mohawk Rivers and the lake plains south of Lake Ontario, and with large areas of agricultural and forest land, has an average density of 218. The average for all of New England is 118; for the Middle Atlantic States, 226.6.

In the South, the states east of the Mississippi have an average density of about 50; those to the west, 24. The most densely populated state in the South is Maryland, with a density of 146; and the lowest is Texas, with less than 18. The average for the South is only about 42.

In the past the densities of the South have been even lower. Georgia which may be taken as representing the median density in 1920, had in 1800 a population density of 1.5. Massachusetts in the same year had a density of 52.6; and Rhode Island, 64.8. At no time in the history of the South have densities approached those of the states of the North and East nor of European coutries in which manufacturing has long been active.

Some Reasons for the Low Density.—There are several possible reasons for the low population density in the South. Immigration has never been active from the North or from Europe. By the time that the yearly arrival of immigrants from Europe had reached 100,000 or more, just before the middle of the past century, all the great passenger liners docked at northern ports; and into New York, Boston, and Philadelphia poured by far the larger part of the European arrivals, to collect in the northern manufacturing cities or to move westward to the cities and farms of the Middle West and West. In 1920 less than 2.6 per cent of the population of the South was foreign-born. For New England, the percentage was 27.7; and for the Middle Atlantic States, 25. Most students of population phenomena contend that the population of the United States would have been what it now is without immigration, that the presence of the foreign element has hindered the normal population increase of Americans. These contentions may be correct, but the sections using foreign labor certainly are benefited by immigration, for a large proportion of the immigrants are beyond the "age of infancy" when they arrive and are thus ready to begin economic production. The South has had to rear all its labor, and thus has been handicapped to some extent as compared to the North and East. Moreover, in the earlier days when the bulk of the immigrants came from north-

western Europe, there were many skilled workmen among them who contributed much to the growth of industry in the sections in which they settled.

In the new movement of population within the country, the South has been passed by, the migrants moving westward. The West had, all along, new and cheap lands. It had mineral prizes to offer, and has great commercial opportunities. It has long been advertised freely. When such a movement of population has once been started, it changes its direction but slowly. The feeling of sectionalism probably has little or nothing to do with the seeming neglect of the South. Economic motives are usually more dominant than political or traditional ones.

The Negro, before and since the Civil War, undoubtedly kept out many immigrants from both Europe and the North. Free labor felt that it could not adjust itself to a slavery régime, and after the emancipation of the Negro white labor did not wish to compete with colored labor with low living standards. In fact, the wage scale was adjusted to Negro labor and was too low for whites to make a respectable living. There were few opportunities for whites to secure work in the factories of the South; besides, all labor with the hands was generally held in disrepute. Many whites undoubtedly were deterred from coming to the South because of false notions about high summer temperatures and poor health conditions. The South has never, until the last decade or so, striven to bring in foreigners and people from the North. It prides itself on being the purest Anglo-Saxon section of the United States and wishes to remain so. Moreover, during the many decades that these factors were checking or preventing migration to the South, there has been a stream leaving the Southern States. Fully 960,000 in 1860 were living beyond Southern boundaries, and every decade since has shown increasing numbers.

It is difficult to say to what extent each of the above factors has influenced the population growth. The fact is, the South has not increased in population in the last one hundred years as rapidly as the country at large nor, of course, as rapidly as other sections. The century's increase for the South has been five-fold; for the country at large, more than ten-fold. For the Middle Atlantic and North Central States combined, which are comparable in area and rainfall to the South, the increase has been more than fifteen-fold, or three times that of the Southern States.

Conclusions as to Effect of Low Density.—Throughout its entire history, therefore, the population density for the South has been that of a grazing, lumbering, and agricultural region. Normal development

would have carried the South through these stages with an accompanying increase in population, as has occurred in other sections of the United States of equal area, and on into the industrial; but accidents have occurred here and there in its economic development to check the growth of manufactures. Its potentialities lie dormânt. Anyone acquainted with the scope and variety of the resources of the South certainly realizes its potentialities, for it has practically all the requisites essential, other than population density, for a highly developed industrial economy.

Although the South to-day is producing only a small part of the manufactures of the country, it has made rapid progress in the last three or four decades, as has been indicated, and the progress made is substantial and permanent, made in accordance with geographic and economic laws, and made in an age of competition in which, in general, only the best located factories survive.

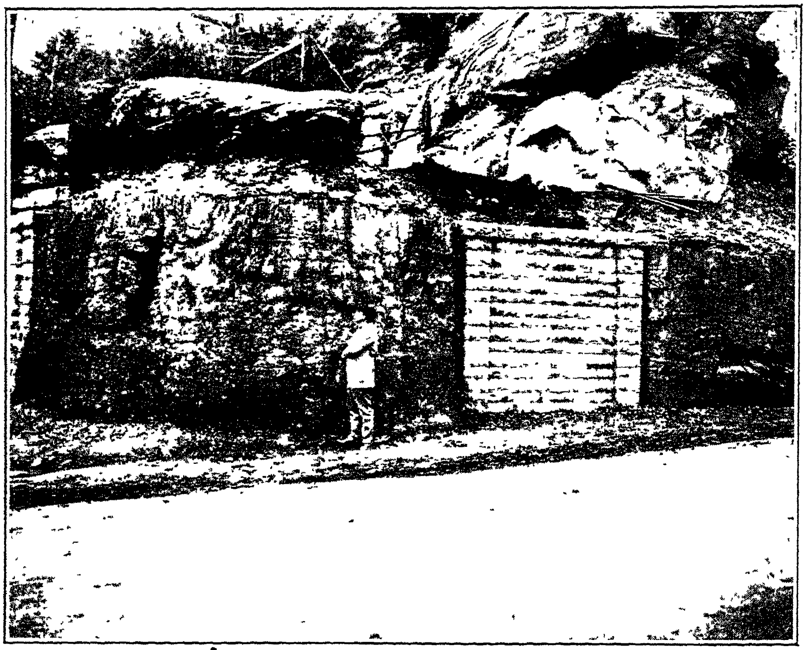
Factors Favoring Manufacturing

The Abundance of Coal.—It is considered by all students of industrial phenomena that one of the strongest factors in the ultimate localization of manufactures is power—coal, oil, gas, water power, tides, and sunshine. Of the most practicable of these sources of power, coal, the South has an abundance. About 60 per cent of the coal reserves of the Appalachian field, the most valuable and the most accessible to the densely populated sections of the United States, is in the Southern States. (Fig. 35.) The coal of the Appalachian field is high in quality and wide in variety, and it is particularly accessible because it lies practically horizontal in the Appalachian Plateaus and outcrops on either side and on the borders of the numerous valleys that dissect the plateaus. (Fig. 164.) Some seams are pierced by shafts driven from the top of the plateau, but drift mining is the more common. The field lies for the most part on the divide between the Gulf and Atlantic rivers. Along some of the deeper rivers, coal may be carried in barges; but most of the coal reaches the markets of the nearby cities and tidewater by rail, gravity assisting greatly the heavily laden cars as they move down grade along the valleys.

West Kentucky has 6400 square miles of bituminous coal lands, and 10,000 square miles of land in Oklahoma are largely underlain with bituminous and semi-anthracite coal. The coal of the central Texas field, being of low grade, finds its market chiefly in the nearby cities and on the railroads. Besides the higher-grade coal, there are many thousands of square miles of lignite on the Coastal Plain.

The wide distribution of coal is of particular advantage to the cities

of the South in which, or near which, the factories of the future will be located. Baltimore is within 150 miles of the Maryland field; Louisville, about 150 miles from the east Kentucky and 100 miles from the west Kentucky field; Nashville, 100–120 from either the Appalachian or the west Kentucky field: Atlanta is about 100 miles from, and Chattanooga and Birmingham near or within the Southern Appalachian field. Memphis is reached by rail or water from the west Kentucky field; and New Orleans, Mobile, and Pensacola may be supplied by



Courtesy of Pocahontas Operators Association.

FIG. 164.—A Thirteen Foot Seam of Coal near Pocahontas, West Virginia.

Pocahontas coal is the navy standard for the country. It is the best steaming coal mined in our country. It has a low ash content and produces the minimum of smoke of bituminous coals. It is well adapted for use in coke ovens and is a favorite domestic coal Drift mining is the practice in the Pocahontas field in southern West Virginia and western Virginia.

river barges from the Birmingham field. Dallas, Fort Worth, and San Antonio lie near the central Texas field. Galveston and Houston get some coal from central Texas and are readily reached from Birmingham or the Chesapeake coal ports by barge and boat. Tampa and the South Atlantic ports are best reached by coasting vessels from the lower Chesapeake ports. With such an abundance of coal and such a wide distribution of high-quality coal, Southern industries are sure to be plenti-

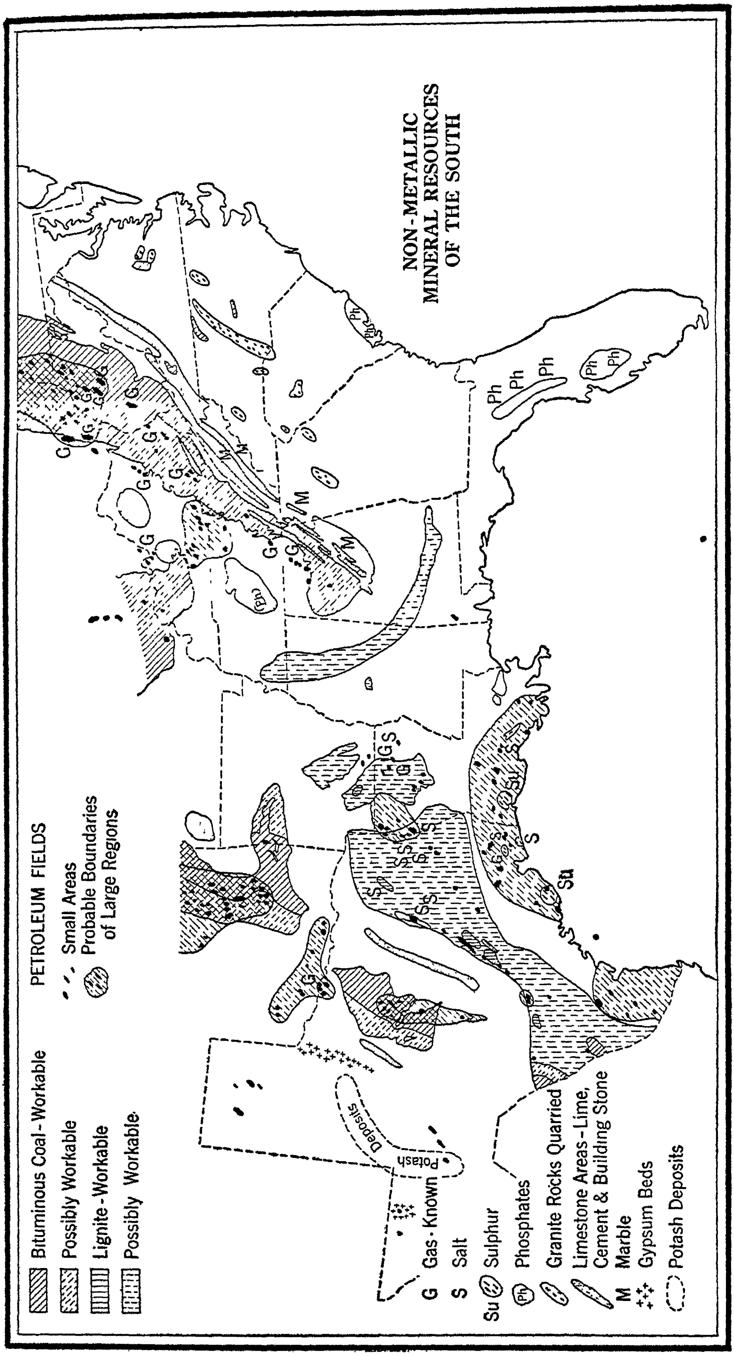


FIG. 165.

Classify the minerals as to physiographic regions. Also as to states. Consult statistical data and show by graphs the relative importance of states or regions of the South and other sections.

fully supplied at a minimum cost, as long as coal dominates industrial development. (Fig. 165.)

Petroleum and Natural Gas.—Petroleum and natural gas, the two other sources of power, are also abundant. Reserves in the ground are difficult, if not impossible, to determine. Estimates have, however, been made. It is estimated that the oil resources of the United States in the ground January 1, 1922, recoverable by methods then in use, were

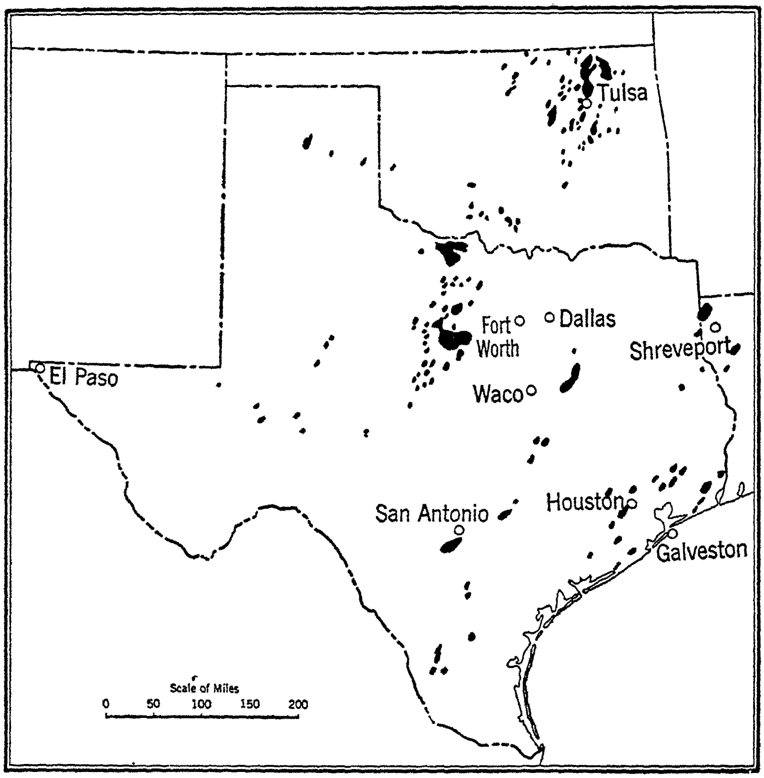
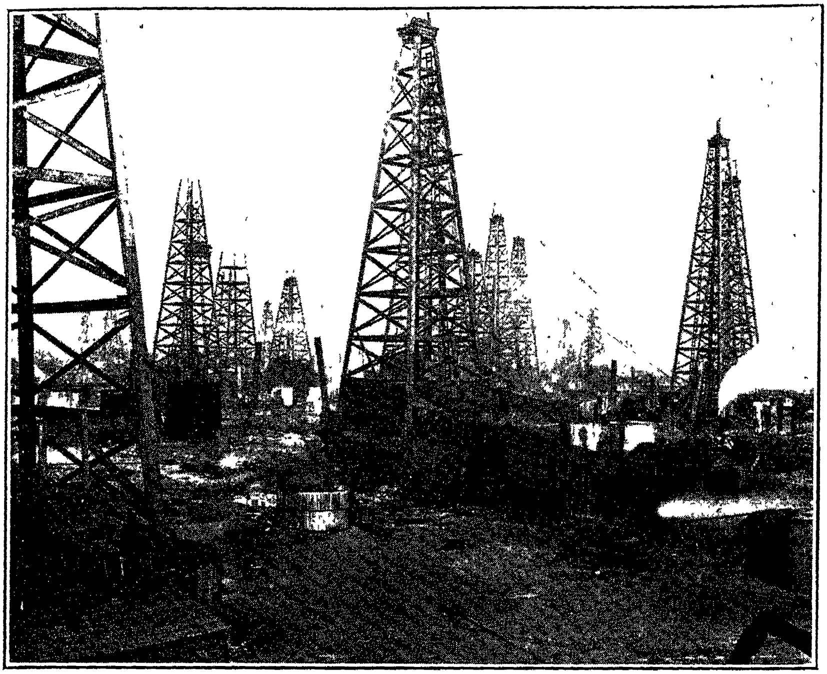


FIG. 166.—The Oil Producing Areas of Texas and Oklahoma in 1927.

more than 9,000,000,000 barrels. The Southern fields are believed to contain more than 5,000,000,000 barrels, or 55 per cent of the total. Of the three leading states in oil production in 1922, two were Southern, Oklahoma and Texas. (Figs. 41 and 166.) Oil is being obtained from all the Southern States west of the Mississippi, as well as from Kentucky and West Virginia, and a small amount from Tennessee. The yield of the South in 1922 was 326,000,000 barrels, or nearly two-thirds of that of the total of the country. (Figs. 167 and 168.)



Courtesy of the Fort Worth Chamber of Commerce.

FIG. 167.—Derricks in the Burkburnett Oil Field near Fort Worth, Texas.

The newest field in Texas is in the Panhandle near the Canadian River. Oil has been discovered in southwestern Texas on lands owned by the University of Texas. Royalties from the exploitation of these pools will give a large endowment to the university, now one of the leading institutions of the South.

The Water Power of the South.—The power which will never become exhausted, and which, once harnessed, continues to do man's bidding at only a small overhead cost, including repairs, is water power. Of this the South has a fair share. The potential power of any stream is determined largely by the volume of water, the degree of constancy of flow, and the fall. Most of the usable water power of the South is in the numerous rivers that flow out of the Southern Appalachian Highlands. (Fig. 169.) All the important rivers of the South, east of the Mississippi have their sources in these highlands. The channels of the streams are not completely graded, owing to the varying hardness of rock or to acci-

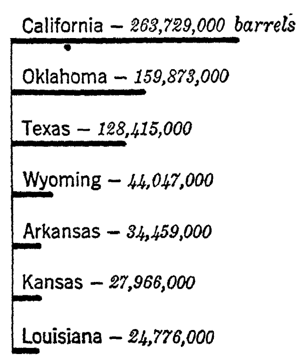
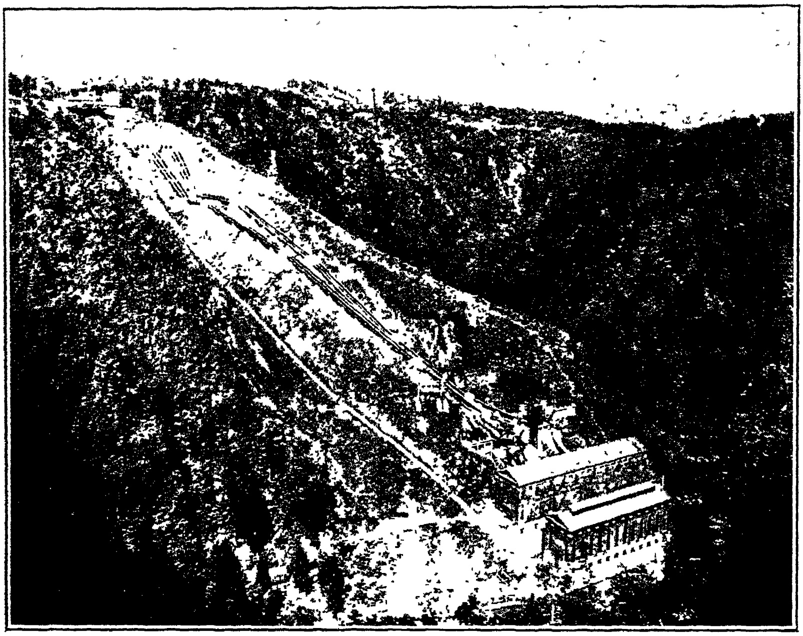


FIG. 168.—Petroleum Production, 1923.

dents, and in the channels there are many pools and rapids, furnishing numerous sites for dams. The heavy rainfall in the highlands gives the rivers a copious flow, and the fairly even seasonal distribution of rain and forest cover at the headwaters tend toward a constant flow. The streams are particularly free from ice, except in the northern section, and the general absence of snows in the watersheds minimizes the danger from floods.



Courtesy of the Georgia Railway and Power Company.

FIG. 169.—Tallulah Falls Power Project in Northeastern Georgia.

This is one of the unique developments in the South The Blue Ridge is deeply dissected. The heavy rainfall supplies numerous rivers with a copious supply of water. Only a beginning has been made in the development of water power in the Southern Appalachian region. The power house at Tallulan Falls is at the bottom of the bluff in the valley. Six large pipes or penstocks lead the water to the power house. Only a small amount of water is needed, because of the high head, to develop the 90,000 horse power, the capacity of the plant.

The potential minimum water power of the South is estimated to be 3,810,000 H.P. available for 90 per cent of the time. This is about 11 per cent of the potential for the United States.[1]

Although the building of power dams has not been so active in the South as in the Northeastern States, the capacity of the installed water wheels in the South in 1927 was estimated to be nearly 2,700,782 horse

[1] Data furnished by U. S. G. S., Jan. 1, 1927.

power, or about 23 per cent of the installed capacity of the power plants of the United States. The hydroelectric power plants of the South to-day could furnish, if all the power were used in the industries, nearly half that needed to turn all the wheels of southern factories.

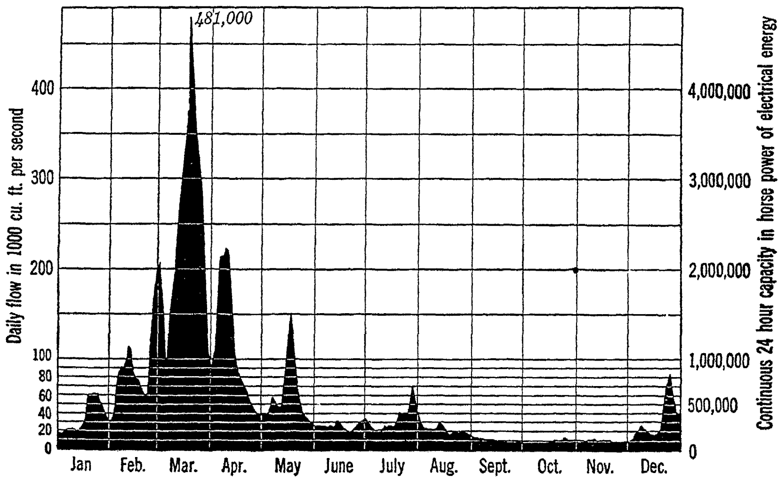
TABLE XII

A PARTIAL LIST OF THE LARGER POWER PLANTS IN THE SOUTH *

	Horse Power
Badin, N. C., on Yadkin River	93,000
Mountain Island, N. C., on Catawba River	80,000
Tallulah Falls, Ga., on Tallulah River	90,000
Wateree, S. C., on Wateree River	90,000
Lock 12, Ala., on Coosa River	110,000
Mitchell Dam, on the Coosa	120,000
Cheoah, N. C., on the Little Tennessee	185,000
Wilson Dam at Muscle Shoals (initial output)	120,000

* Data from Atlas of Com Geology, 1920

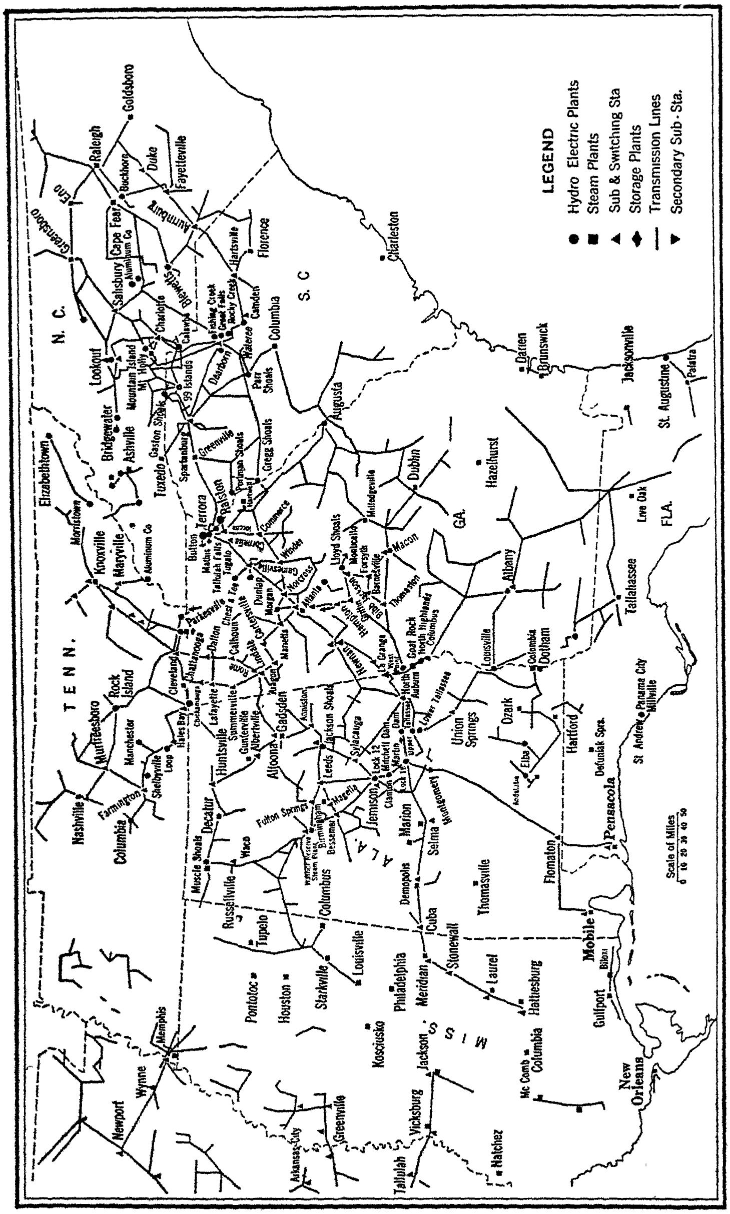
Constancy of supply is desired by all industrial plants using water power. (Fig. 170.) As an attempt to insure this, the United States Government has for many years been establishing forest reserves in the



Courtesy Samuel Wyer, Engineer, Columbus, Ohio.

FIG. 170.—Variation in Daily Flow and Horse Power of Tennessee River.

The continuous 24-hour capacity in horse power of electrical energy at the various "flows" of water is shown on the right margin of the diagram. At 10,000 cubic feet per second 100,000 horse power may be developed. This is the quantity the United States Government is providing for at present. Most of the water above the 100,000 horse power line is now wasted. By a series of reservoirs at the headwaters of streams and dams at various places along the river and extensive reforestation, the flow may be made much more uniform and thus more continuous power would be available.



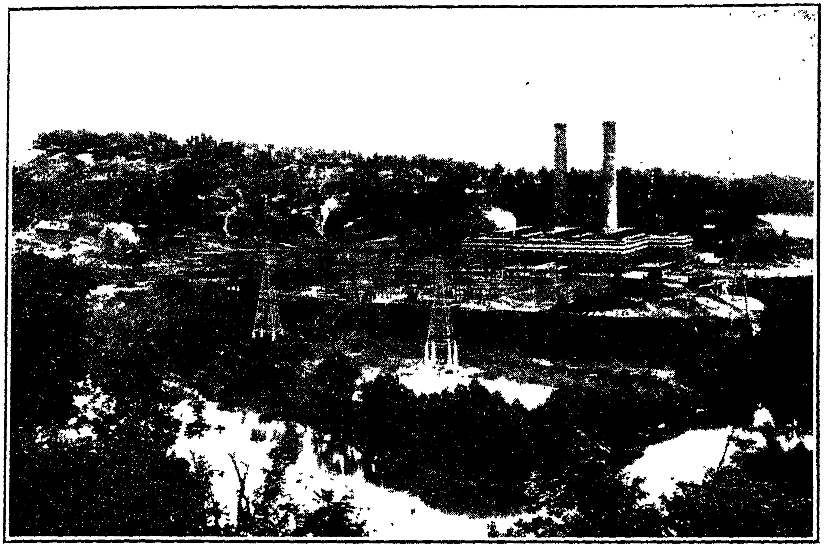
Courtesy Alabama Power Company.

FIG. 171.—Hydroelectric Lines in the South, 1927.

Steam and waterpower plants are so interconnected that North Carolina plants may in emergency receive assistance, indirectly, from one or many plants in Alabama.

highlands and recently has planned parks in which the forest cover will be largely retained. Most of the great power companies operating in the South have interconnected their power systems. (Fig. 171.) They operate several large steam-driven electric plants located near or

in the coal fields in connection with the water-driven dynamos, and these may be called upon in emergencies. A protracted drought, a washed-out dam, or an impaired dynamo no longer causes suspension of operations in any industrial plant supplied by this interconnecting system. From southern Virginia to western Alabama, the hydroelectric current is at least 85 per cent constant. (Figs. 171 and 172.)



Courtesy of Alabama Power Company.

FIG. 172.—The Gorgas Steam Plant of the Alabama Power Company.

This plant is located on the banks of a clear stream near a coal mine owned by the company. This insures comparatively low cost production of electricity. The capacity energy output of this plant is 100,000 horse power. The Southeastern Power Company, operating in Mississippi, Alabama, Georgia, and South Carolina, has twenty-one hydroelectric plants, thirty-three fuel plants, and nineteen leased plants, generating in all more than 1,200,000 horse power. These plants are linked up with plants of other operating companies in the South.

A Large Variety of Raw Materials

Cotton.—Of raw materials suitable for manufacture, the South has a wide variety, and of some materials it has a large quantity. Cotton is far and away the most important of the raw materials of the South. In 1919 more than $800,000,000 were invested in cotton manufacturing plants (spinning, weaving, dyeing and finishing); scores of millions more in cotton gins, warehouses, and compresses; and billions in land, buildings, and machinery, largely used in the production of this greatest of textiles. One estimate gives more than $6,000,000,000 of invested capital in the South for the growing, transportation, and manufacture of

cotton. Less than 40,000,000 acres in recent years have been planted in cotton, as previously stated, yet the potential cotton acreage is fully 300,000,000. The world's demand at moderate prices is between 20,000,000 and 25,000,000 bales. Even at half a bale per acre, the South could produce, if all the better cotton lands were used, six or seven times the world's present demand. It is only by curtailing production that the price of raw cotton is kept above starvation returns for the farmer. And it is very probable that the monopoly now held by the South in the production of raw cotton is to continue for a long time. Here, then, is a raw product whose culture the South largely monopolizes, and a raw product for which the demand in normal times is increasing at the rate of 500,000 bales a year and will become even greater as the tropical lands are opened up through modern means of transportation.

Other Farm Products.—Among the other agricultural products are cottonseed, corn, and peanuts, all yielding vegetable oils that are increasing in demand year by year. Cottonseed will increase only as cotton production increases; but the areas given to the two other oil-producing products may be greatly extended. Fruit and vegetables for canning and preserving find congenial climatic conditions in the South. At present, production is limited chiefly by the demands of the early northern markets. A greater number of canneries would reduce the hazard of late seasons and glutted markets, and benefit the producers greatly.

The Timber Resources.—The timber resources of the South have long been the basis of an extensive sawmill industry and of a less important woodworking industry. (Fig. 180.) Nearly every portion of the South, except the semi-arid parts of Oklahoma and Texas, was once covered with dense forests. (Fig. 43.) The Southern or yellow pine, of which the long-leaf pine is the most prominent variety, was confined for the most part to the Coastal Plain. Over the remainder of the forest area there were hardwoods. Most of the hardwoods and some of the pines on the lower lands have been removed to make way for agriculture. The pines for two centuries have dominated the lumber industry, the hardwoods becoming of importance only in the last few decades. Although the slaughter of the forests has been great, the Southern States in 1920 furnishing 37 per cent of the lumber cut in the United States, there are still great stretches of hardwood in the Appalachian Highlands and of pines in Mississippi, Florida, Alabama, Louisiana, and Texas. Although these will be removed in thirty or forty years, if the present rate of cutting continues, by the adoption of and adherence to a sane forestry policy, utilizing all the essential areas at the head waters of streams along which there are water-power plants,

and growing trees on the rough, hilly, stony areas and areas that are unprofitable as agricultural land, the South may grow sufficient timber to meet its needs for many decades, if not for all time to come. There are tens of thousands of square miles of cut-over land on the Coastal Plain, now idle or supporting a few cattle to the square mile, that should be growing timber. All that need be done to put much of this land to the production of forests is to modify the tax laws in favor of forest lands. Nowhere in the United States do forest trees grow so rapidly. The

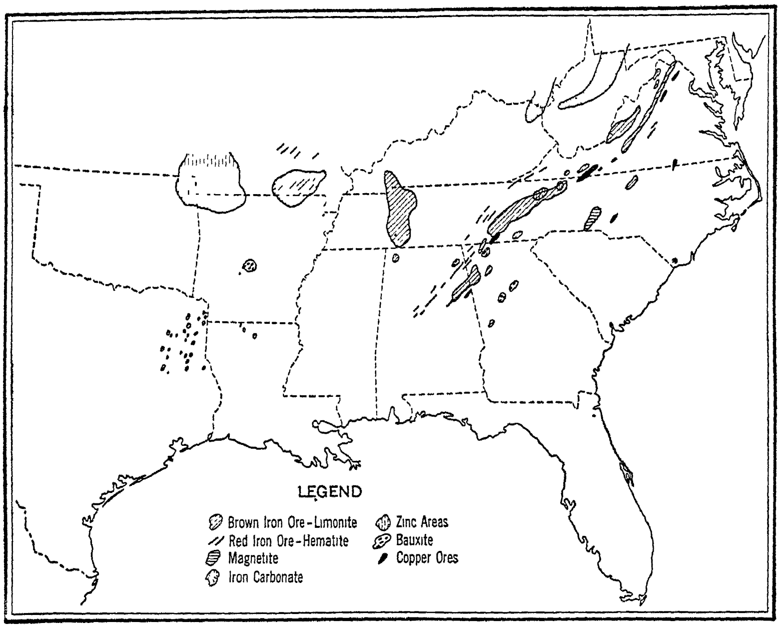


FIG. 173.—The Metallic Minerals of the South.

The workable iron ore deposits are largely in the Appalachian Valley, and in most regions near coal beds. The South holds the monopoly in the production of bauxite. The zinc ore deposits of Arkansas and Oklahoma are extensions of the well-known Missouri field. In what physiographic provinces is each of the minerals listed in the legend? (Fig 145.)

timber crop, which is the basis of many industries, can be made as constant a product as corn or cotton.

The Mineral Resources.—The rocks of every geologic period are represented in the Southern States. There are old igneous, metamorphic, young igneous, old sedimentary, and recent sedimentary. It is not surprising, therefore, that the variety of minerals of economic importance is great. Of a few,—and happily they are among the more useful,—the South has great stores, in fact, holds practically a monopoly. (Figs. 165 and 173.)

Iron Ores.—Iron ore is widely distributed and, in general, excellent in quality. A late estimate (Ekel, in 1913) gives the South iron ore reserves of 2,600,000,000 tons. From five to seven million tons are being mined yearly in recent times in the South. This means that, even with two or three times the present activity in iron-ore mining, there is in the South sufficient ore to last from two hundred to three hundred years.

The iron ore of the South is widely distributed. During the period of high prices and active demand, ten or more Southern States mined and shipped iron ore. The chief deposits are located in the great Appalachian Valley, occurring here and there from western Virginia to central Alabama.

At only a few places in the Great Appalachian Valley are the ore deposits being mined. There is thus great opportunity for further expansion in the number of blast furnaces and the iron industry in general, for good coking coal and limestone exist within a few miles of nearly every deposit. Thus geographic conditions favor the production of iron in the South as cheaply, if not more cheaply, than in any section of the country.

Copper.—Copper does not occur in relatively large quantities, nor do the deposits compare with those of Utah, Arizona, Nevada, New Mexico, Montana, and Michigan in richness of ore and production and reserves. There is probably little chance for greater expansion in this field. The one large plant in the South is at Ducktown, to the east of Chattanooga. The ore mined is a sulphide, and in 1898 a large addition was made to the plant to manufacture sulphuric acid as a by-product. The mines were opened in 1842, and it was from them that the Confederate States obtained all their copper during the Civil War.

Bauxite.—Of bauxite, the ore from which aluminum or aluminum salts and artificial corundum are obtained, the South has a monopoly. Arkansas bauxite dominates the aluminum industry to the extent of furnishing more than 90 per cent of all the bauxite consumed in the country. Tennessee, Alabama, and Georgia also have deposits. The South, therefore, is intimately interested in any expansion that may take place in this industry in the future.

Sulphur.—Since 1906 the South has come to hold the monopoly in sulphur production in the United States, and even in the world, for about 99 per cent of the sulphur consumed in the United States and 75 per cent of that of the world comes from Louisiana and Texas. In these states the sulphur occurs in huge domes 100 feet or more thick, and 3 or more miles across. The Frasch process, which employs superheated water to melt the sulphur in the ground and air pressure

to force the melted sulphur to the surface, reduces the production of this useful mineral to a very low cost. Sulphur is produced at so low a cost in the Gulf area that only by agreement between Italy and the American companies are prices maintained sufficiently high to permit the mines of Sicily to operate. In 1920 Louisiana and Texas produced more than 1,250,000 tons. Before 1906, Sicily furnished the world with sulphur. In 1920 we imported only 138 tons and exported nearly half a million. The demand for sulphur is increasing year by year in many industries. The immense quantities and the low cost of production make it certain that the South will maintain its dominance in this mineral for many decades to come.[2]

Potash.—Oil drillers have discovered deposits of potash in southwestern Texas and nearby parts of New Mexico, the extent of which will not be known until economic geologists have made detailed surveys. The area beneath which potash has been found is 125 miles wide and 275 miles long. There is a possibility that Texas may free our country from the monopoly, so long held by Germany, and become the seat of great chemical industries associated with potash.

Phosphate Rock and Clays.—The states of Tennessee, Florida, and South Carolina produce about 99 per cent of the phosphate rock in the United States, and about 60 per cent of the total of the world. The importance of this resource in agriculture can hardly be estimated. The demand will certainly increase as our soils become more depleted of their phosphorus content and intensified faiming increases.

Raw materials for the clay industry, in all its phases from common brick to porcelain, is widely distributed, and so also are the ingredients for cement.

Other Minerals.—Among the other minerals which are produced in large quantities in the Southern States, for which there is a call in the industries, are zinc, asbestos, mica, graphite, feldspar, limestone, and gypsum.

Other Factors Affecting the Growth of Industry

Other factors influencing the localization of factories are capital, labor, and markets.

Capital is mobile. It tends to flow to the region that promises the largest return and the greatest security. For a century or more, the greatest movement in America has been westward. Some capital has

[2] It was reported in 1925 that the sulphur mine in Louisiana had exhausted its deposits. The company had a large stock of sulphur on hand. A "severance" tax is paid the state for every ton mined.

come south; but for the most part the South has been overlooked. There are many reasons for this condition: slavery, the Civil War, and others. The South has never advertised as has the West. With active and honest advertising of the advantages to be found in the South by manufacturers, the inflow of capital from the great financial centers should be far greater than it has been in the last three or four decades. (See discussion, pages 305 to 309.)

The low population density and the consequent scarcity of manufacturing population in the South have previously been discussed. Whether or not the South will be checked in its industrial development by the low population density will depend upon the rate at which new factories are introduced. Even without immigration, the rate at which industries are now being introduced will need to be increased materially to utilize the labor that the normal population increase will provide. Inasmuch as the rural population of the South exceeds the urban, most of the laborers demanded for the new factories will come from the farms, and the increasing use of farm machinery tends to release labor for the factories.

The South does not possess the proportion of skilled labor that the older manufacturing sections of the country do. This condition, while of some importance, is not so serious as formerly when hand labor was more prevalent in industry. Automatic machinery, moreover, is greatly reducing the number of skilled laborers needed in any factory. The initiative and proverbial inherent ingenuity of the people of America—and most of the laborers of the South are native-born—will enable any plant to develop skilled workmen within a short while. The experience of superintendents in cotton mills, furniture factories, and machine shops, in dealing with raw industrial help, shows what may be done even by unskilled workmen. Operators and foremen who are acquainted with labor and labor conditions in both northern and southern factories point out many favorable characteristics in southern laborers. In most trades and in most parts of the South, labor is cheaper than in other sections of the country. Some wage scales are dominated by the presence of Negro labor, but this is not the basic cause of low wages. Many of the laborers are fresh from the farms and unaccustomed to large labor returns. Living expenses of laborers are generally low in the South, for coal bills, housing costs, and clothing bills are influenced by the genial climate of the southern latitudes. Laborers accustomed to farm life are more economical in their living than those accustomed to urban life. They are unionized only with difficulty and are not easily led by labor leaders. How long the manufacturers will be able to take advantage of these favorable conditions, and how long these characteristics

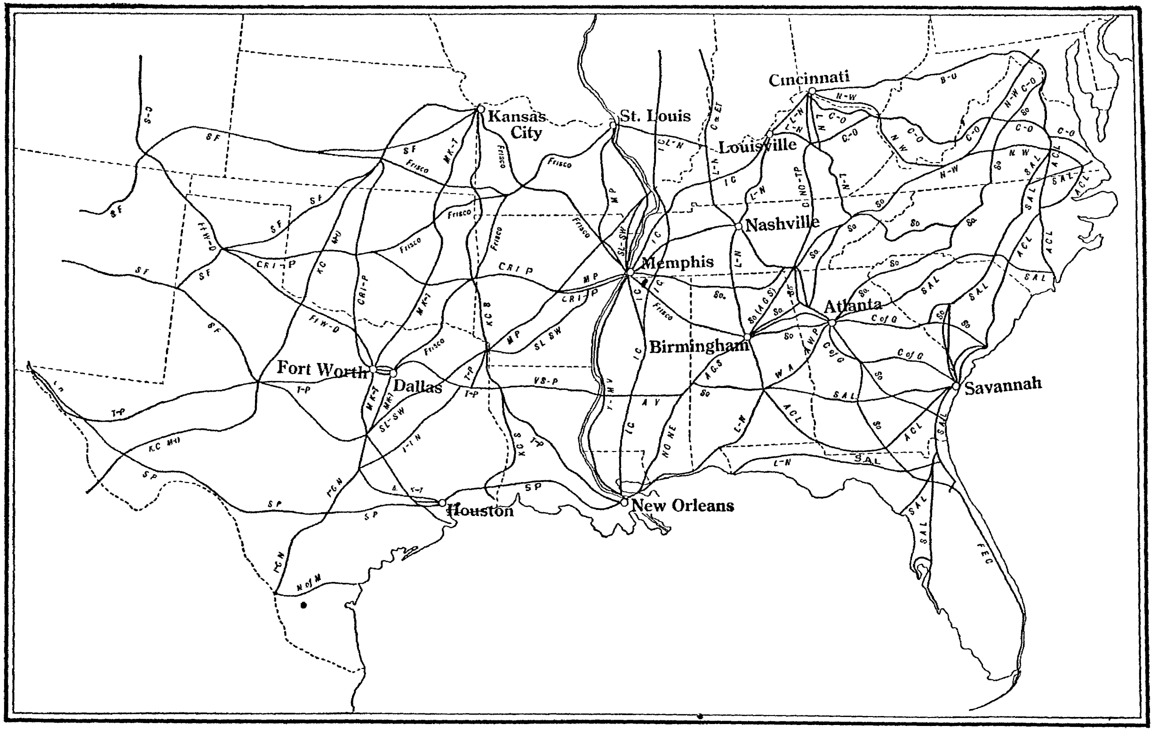


FIG. 174.—The Important Railroads of the South.

Classify the railroads as to directions: roughly, northeast–southwest; north–south; east–west., etc. Which class dominates? Give geographic reasons for this dominance. Work out the types of commodities likely to be carried by these classes. What seasonal variations will there be in the types of commodities? Name the leading railroad centers of the South, judging from the railroads shown on this map.

will persist as factors in enticing manufacturers to the South, is problematic.

The problem of markets, their accessibility and absorbing power, is also of prime importance in the localization of industries. Inasmuch as the South is now producing, and will in the future produce, commodities similar, for the most part, to those of the factories of the North, it can hardly hope to send much of its goods northward. Its hope lies, first of all, in developing its own local markets and thus replacing northern-made goods. This it should do since it can in most indus-

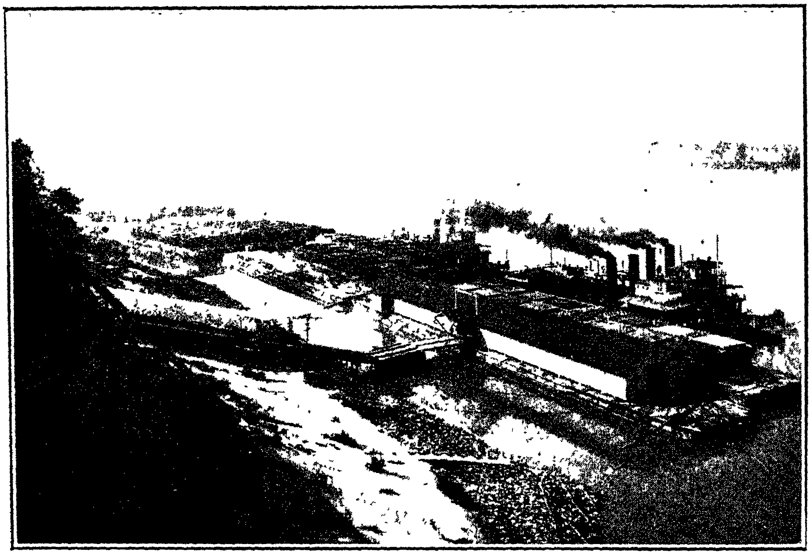
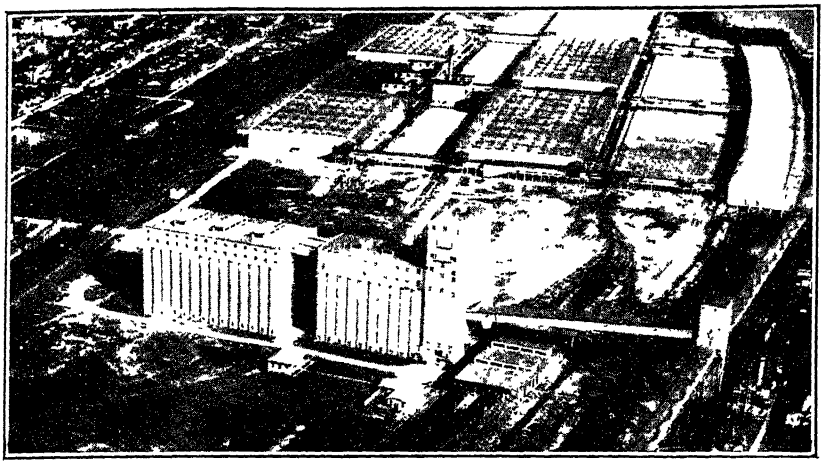


Photo by Polard. *Courtesy Memphis Chamber of Commerce.*

FIG. 175.—Barges of the Mississippi-Warrior Barge Line.

This line plies between New Orleans and St. Louis. The barges are shown unloading at the Municipal River and Rail Terminal, Memphis, Tenn. This is one of two municipal terminals erected by the city of Memphis at a cost of $3,000,000. St. Louis has provided river terminals. The Mississippi River with its barges give Memphis and St. Louis an all-water route to the ports of the world.

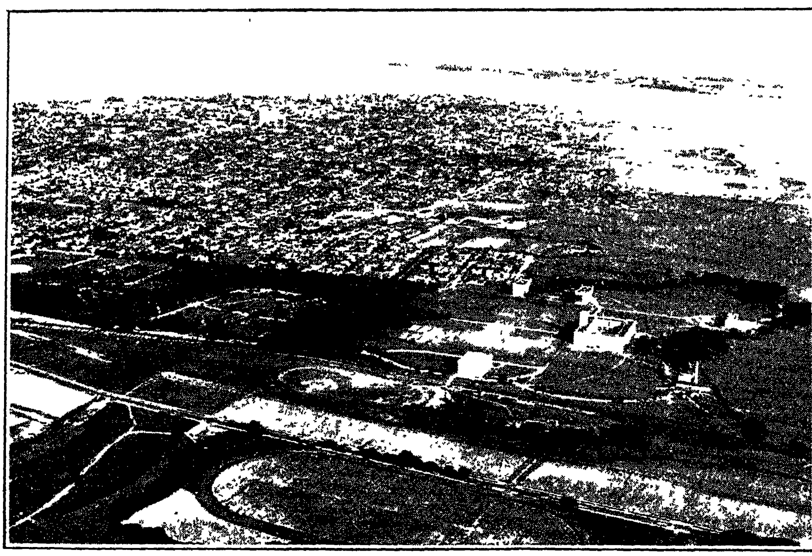
tries manufacture products more cheaply than northern factories, and has the advantage of freight charges. Its own markets are of no mean proportion, for here are more than 30 per cent of the people of the United States, and the purchasing power of these people is great. In the contest with the North or Europe for foreign markets, the South again has the natural advantage in position when markets are sought on the American Mediterranean and nearly all countries bordering the Pacific. The Panama Canal gives the South a decided advantage in obtaining the trade of the west coast countries of South America and



Courtesy of New Orleans Chamber of Commerce.

FIG. 176.—Airplane View of Grain Elevator (foreground) and Cotton Warehouse in New Orleans.

These are state owned, thus insuring free competition among rail and water carriers and low storage and transshipment costs. All these facilities are thoroughly modern. These two buildings handle cargo lots, mainly shipped by tramp steamers overseas.



Courtesy South Carolina Power Company.

FIG. 177.—Charleston, South Carolina, the Harbor and the Atlantic.

Charleston has been a world port since 1670 and to-day is one of the principal South Atlantic cities. It has a United States Navy Yard, a great variety of industries, and is becoming a well patronized winter resort. The quaintness and historic interest of the old section of Charleston attracts many visitors at all seasons.

our own Pacific possessions. New Orleans is 450 miles nearer Valparaiso, Chile, than is New York, and more than 1000 miles nearer than is Liverpool. New Orleans is 500 miles nearer Puget Sound by way of the Panama Canal than is New York. If proper port facilities and ocean traffic lines are provided, the geographic position of the South will be of particular advantage to its manufacturers seeking markets in these regions. Every important port in the South to-day, on the Gulf and the Atlantic, is active in providing wharves, railroad terminal facilities, and warehouses, is enlarging its shipping, and is spending scores of millions of dollars. New Orleans alone will have $100,000,000 invested in harbor improvements. In this activity there is much rivalry in organizing traffic routes, securing particularly favorable railroad rates with interior points, and providing the best port facilities. (Figs. 174, 175, 176, and 177.)

THE MAJOR INDUSTRIES

Iron and Steel

The Beginning of the Industry.—One of the earliest industries established in the Jamestown settlement was the manufacture of iron. During the first half of the eighteenth century several furnaces and forges were built in Virginia near the Potomac River and the Chesapeake Bay, where "hollow ware" was cast and sold throughout the colonies to the south. Some of the pig iron was sent to England, and even to Massachusetts and Rhode Island, for further manufacture.

At many of the settlements later established beyond the Blue Ridge, there were small forges and furnaces, making iron implements and utensils that could be brought from the eastern foundries only with great difficulty and at considerable cost.

In 1810 the South was producing about 18 per cent of the pig iron of the country. Virginia stood second among the states of the Union, and Maryland fourth. By 1840, 26 per cent of the country's iron was made in the South; but about this time there began a rapid concentration of the iron industry nearer the anthracite coal fields in the Scranton and Wilkes-Barre region and anthracite replaced charcoal as a fuel in Pennsylvania. Then began the rapid rise of the iron industry in the North.

During the Civil War the iron industry necessarily increased greatly in the South, because it had no competition and was called upon for emergency production. Furnaces were built in most of the iron ore districts. The west central Tennessee furnaces, following the Union

invasion of Tennessee, were closed; but those of central and northern Alabama, northwest Georgia, and southeast Virginia continued in operation until near the close of the War. However, many of these ceased operation or curtailed their output during Reconstruction times. It is estimated that not over 5 per cent of the output of the United States was made in the South at the close of the War. Since 1880 the production of the Southern States has ranged from approximately 8 to 20 per cent of that of the country. In 1920 the output was about one-tenth of that of the country, and one-fourth that of Pennsylvania.

The Rise of Birmingham.—In the decade between 1880 and 1890 the Birmingham region began its rise, but this decade also saw the opening of the rich iron ore deposits west of Lake Superior and their cheap transportation to the Pittsburgh region; so it is not surprising that the

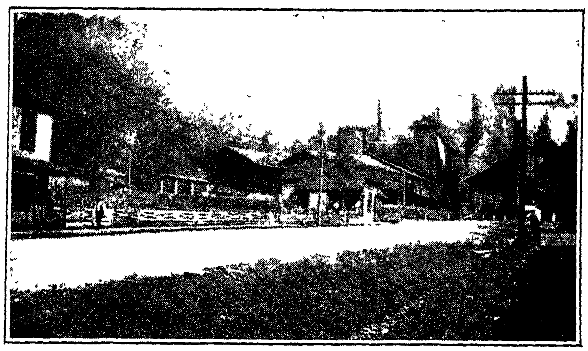


Photo by Parkins.

FIG. 178.—Blast Furnaces at Rockwood, Tennessee.

The hill in the background is the Cumberland Escarpment. Coal seams outcrop on its face and iron ore is mined less than a mile distant from the blast furnace. Limestone is also quarried nearby.

growth of the industry in the country as a whole was greater than in the South.

The modern iron industry of the South really began in 1867 with the building of the Rockwood furnaces at Rockwood, Tenn., by ex-Union army officials who were attracted to the area by the admirable natural conditions offered for the production of pig iron. (Fig. 178.) The modern industry in Alabama dates from 1876 when a coke oven was opened at Oxmoor. Three years later the first coke oven at Birmingham was completed, and the rich hematite replaced the limonite which had been the ore used at the forges in the Blue Ridge areas and in the charcoal furnaces.

Distribution of Furnaces.—By far the larger number of active furnaces in the South to-day are located in the Great Appalachian Valley.

In 1919, Virginia had 12 furnaces in operation; Tennessee, 8; and Alabama, 21. The outlook for the industry in the South is bright insofar as geographic conditions are concerned, for ore, fuel, and limestone are in close proximity. Man is largely the determining factor of the industry. He may circumvent these favorable geographic conditions, or avail himself of the opportunities offered. The increasing use of agricultural implements on southern farms, the active construction of large business and public buildings requiring steel structures, the improvement of railroads, the extension of the underground pipe lines of various sorts, and the expansion of the foreign trade all call for a great amount of iron and steel. Birmingham steel rails and other iron commodities are finding their way into the great Asiatic markets as well as to the Pacific Coast of the United States and Latin-America.

The Forest and Woodworking Industries

Forest Industry One of Long Standing.—The history of the lumber industry in the South does not stir one who is interested in the welfare of these states with the spirit of exultation, as does the story of cotton. The story of the lumber industry is a recital of three centuries of wanton waste and destruction, with no attempt until late decades to reduce the waste and to compensate, by reforesting, for the destruction and devastation. For three hundred years the forests have been a revenue-producing resource, a resource whose value has ever been increasing. For two hundred and fifty years the forests were largely believed to be an obstruction to agriculture. It is only in the last five decades that they have become one of the leading sources of commercial timber for the country. It is estimated that four-fifths of the original yellow-pine stand has been cut since 1870. For some ten or twelve years before the Civil War, the Southern States were producing about 15 per cent of the lumber cut of the United States. During and following the Civil War, the cut in the South declined and did not reach its pre-war importance until about 1885. Most of the lumber consumed in the country until about 1850 came from the Northeastern States. By that date the Great Lakes Region was just at the beginning of its spectacular rise; it reached its highest point of production in 1885, and by 1890 was on the decline. The Northeastern States had been declining for half a century. Since 1898 the South has been the leading lumber-producing region in the country. (Figs. 179, 180, and 181.) Most lumber yards in the United States east of the Mississippi River carry southern-grown and sawed lumber. Southern hardwoods, which are shipped chiefly from Nashville and Memphis, are used in furniture factories, implement and wagon works, planing mills, etc., as far west as the Rocky Mountains.

In late years the waste in the lumber industry has been greatly reduced. Some of the larger lumber plants of the South have paper mills and turpentine and chemical distilling plants in close proximity to the sawmills and planing mills, so that limbs, stumps, and low-grade timber are no longer burned or left to rot but are manufactured into valuable by-products.

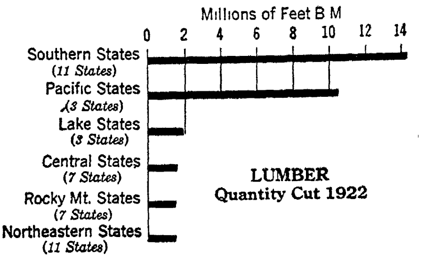


FIG. 179.

Naval-stores Industry.—Naval stores, paper and pulp, and articles of wood are largely products of secondary forest industries. The naval-stores industry has existed since Colonial days. About 1700 the British Government offered a bounty for the production of naval stores. The center of the industry has migrated southward. It is largely centered

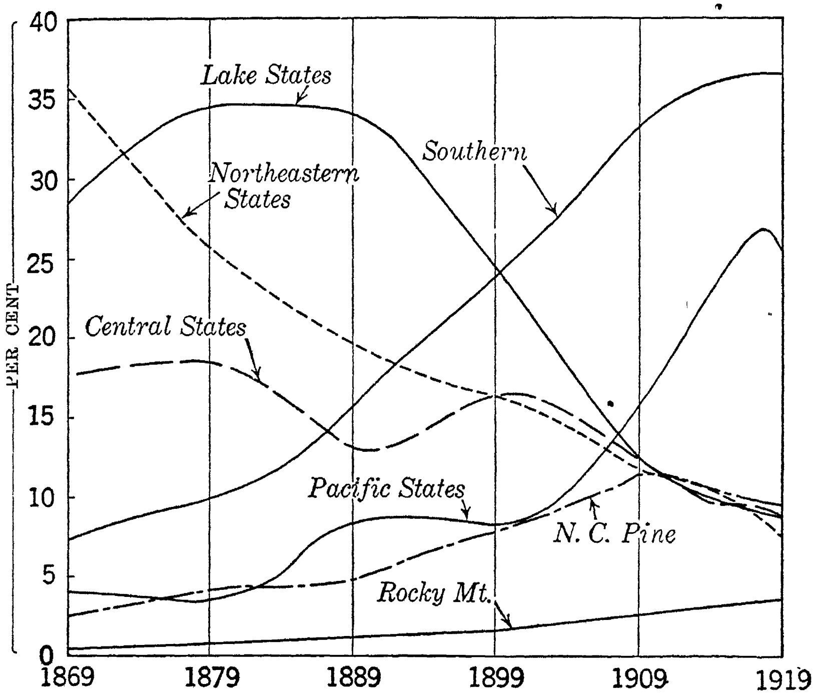


FIG. 180.—Graphic Representation of the Rise and Decline of Lumbering in the Various Forest Regions.

Interpret these curves. Write the history of lumbering in each of the regions. Lumbermen have often migrated from one region to another. How do the graphs show the direction of migration?

Western States that first localized the furniture industry in Grand Rapids, Evansville, and other cities; and it is the momentum of establishment that has carried it on to its high rank in these states. The South has every advantage that these states originally had. It now has the greater bulk of the hardwood of the country and is nearer the cabinet-wood supply of tropical America than the northern furniture centers. Time will give the southern workmen skill and artistry, and their goods will win markets. Already much of the southern-made furniture is sold

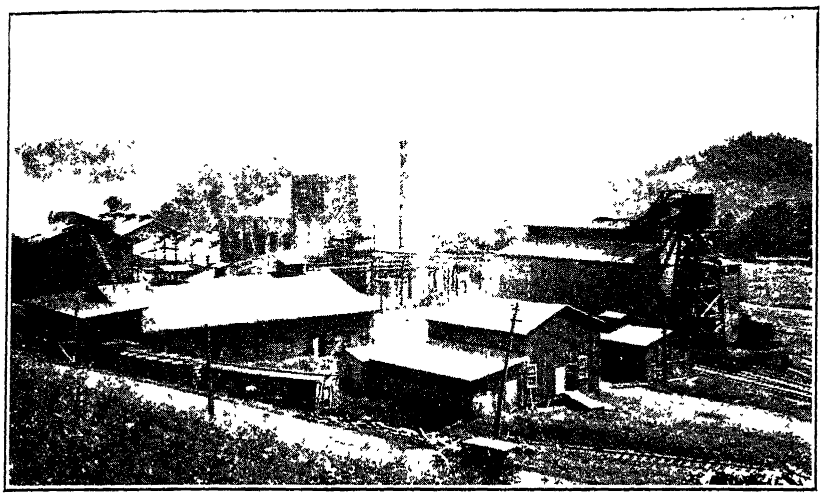


Photo by Parkins.

FIG. 182.—A Tannin Extract Factory near Sylva, N. C.

Tanneries, extract factories, and paper mills in the Southern Appalachian Highlands are numerous. Chestnut wood and bark supply tanning material. Several sorts of wood are consumed in the paper mills Some of the larger companies are reforesting cut-over lands.

in northern salesrooms, and it should soon dominate all southern furniture markets.

COTTON MANUFACTURES

A Southward Migration.—The most rapidly growing industry in the South to-day is cotton manufacturing. From 390,000 spindles in 1869 to 16,000,000 in 1922, and from 8200 looms in 1869 to 300,000 in 1922 is the growth that has taken place in about fifty years in the cotton industry in the South.[3] This growth is all the more apparent when it is known

[3] In 1926 it was reported that there were 18,000,000 spindles in the Southern States, which operated 61.5 million spindle-hours. All other states had 19,500,000 spindles, operating 35.5 million spindle-hours.

that in the United States during the same half-century or more the number of spindles increased only from 7,000,000 to 32,000,000, and that the South in 1870 had only 5.7 per cent of the spindles of the country, whereas to-day it has nearly 50 per cent.

In no other region of the world are the geographic conditions quite so favorable for cotton manufacturing as in the Piedmont area from southern Virginia to central Alabama. In the twenty years between 1900 and 1920, the number of spindles in North Carolina has increased from 1,000,000 to more than 4,600,000; in South Carolina, from 1,100,000 to 5,000,000; in Georgia, from 500,000 to 2,500,000; in Alabama, from 400,000 to 1,800,000; and in the South as a whole, from 4,500,000 to 14,600,000. Since the World War the growth has been exceedingly rapid. The South now has one-tenth of the spindles of the world, and

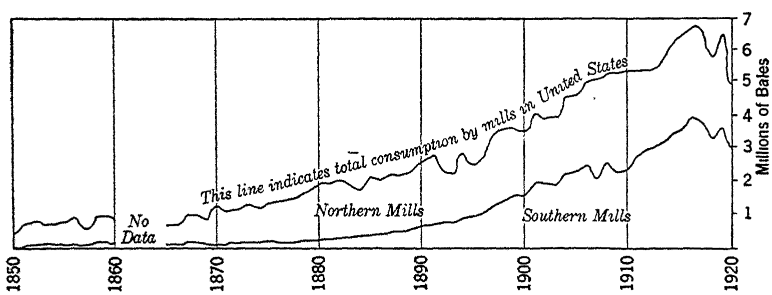


FIG. 183.—Cotton Consumption by Northern and Southern Mills.

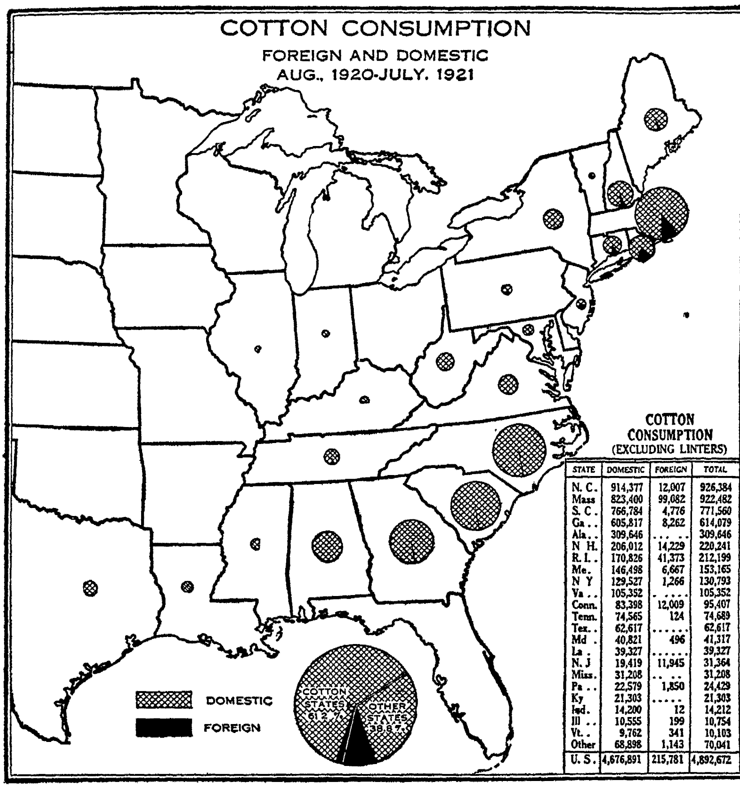
It is in the last decade or so that southern mills have made their greatest advance. Estimate the relative consumption in 1880. In 1900. In 1920.

New England is losing its time-honored hold on the industry. (Figs. 183, 184, and 185.)

There has been little or no expansion in New England industries in the past five years. Most of the water power sites in southern New England have been utilized. Many of the mills are equipped with antiquated machinery, yet too good to be scrapped. And these conditions, along with the adverse legislation and the great strength of the labor unions, are restricting production from further expansion in New England. Companies desiring to expand find it more economical to extend their operations into the Southern States where there is plenty of cheap hydroelectric power, cheap land, low taxes, the raw product close at hand, and an adequate supply of English-speaking labor, intelligent and quick to learn.

Some Comparisons.—In the southern mills the normal work week is 66 hours; in New England it is but 58 and the labor unions are fighting

for 48 and even 44. Data collected from North Carolina mills show that in that state each spindle operates 2658 hours per year, while those in New England operate only 1617. The average full-time wage per hour in New England is 39 cents; in the South, 22.2 cents. The average full-time weekly wage in New England is $15.85; in the South, $12.68, or a saving of $3.27. Competent authorities say that the output per worker



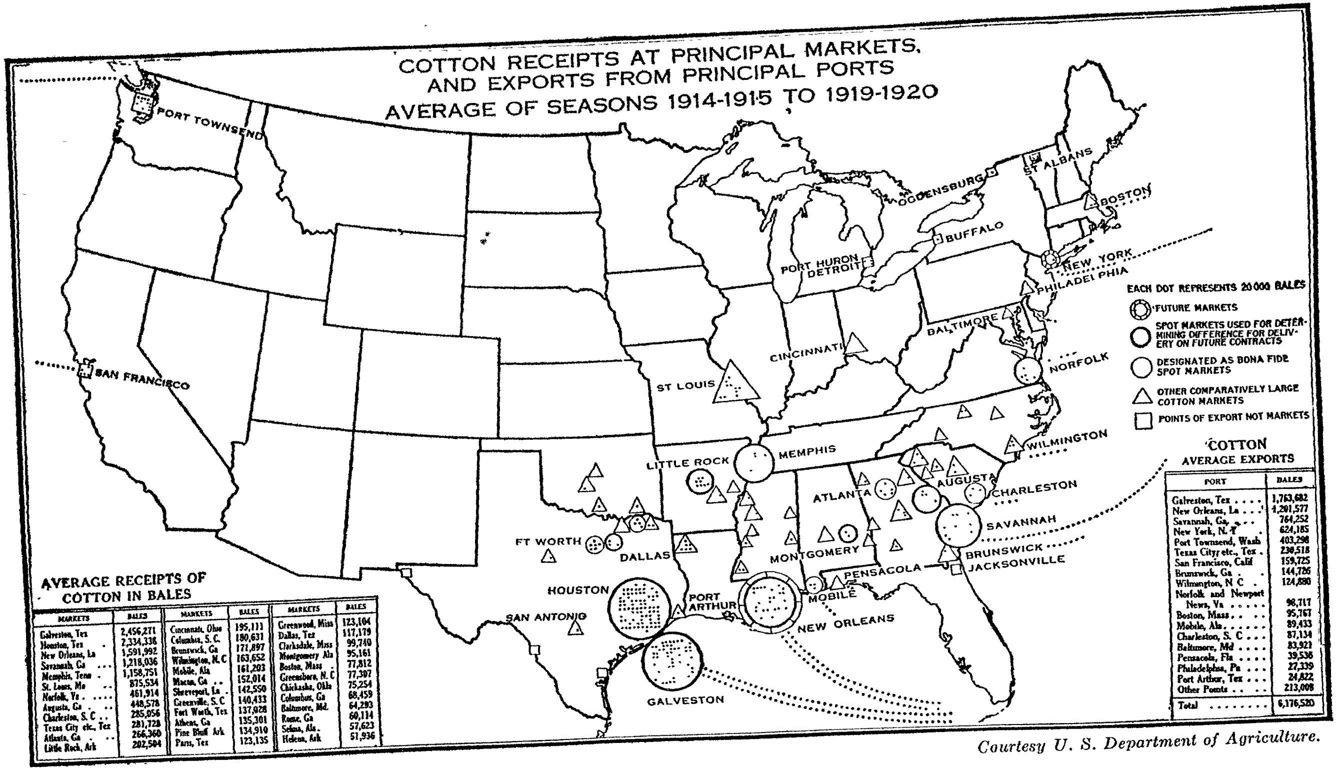
STATE	DOMESTIC	FOREIGN	TOTAL
N. C.	914,377	12,007	926,384
Mass	823,400	99,082	922,482
S. C.	766,784	4,776	771,560
Ga. .	605,817	8,262	614,079
Ala. .	309,646	.....	309,646
N H.	206,012	14,229	220,241
R. I. .	170,826	41,373	212,199
Me.	146,498	6,667	153,165
N Y	129,527	1,266	130,793
Va . .	105,352	.....	105,352
Conn.	83,398	12,009	95,407
Tenn.	74,565	124	74,689
Tex. .	62,617	......	62,617
Md .	40,821	496	41,317
La .	39,327	......	39,327
N. J	19,419	11,945	31,364
Miss.	31,208	.. ..	31,208
Pa . .	22,579	1,850	24,429
Ky	21,303	.....	21,303
Ind.	14,200	12	14,212
Ill . .	10,555	199	10,754
Vt. .	9,762	341	10,103
Other	68,898	1,143	70,041
U. S.	4,676,891	215,781	4,892,672

Courtesy U. S. Department of Agriculture.

FIG. 184.

For several years the southern mills have been using more than half the cotton consumed in the United States In 1921 about 61 per cent was consumed in the South. See Fig. 183. What southern states are active in manufacture of cotton?

is about as great in the South as in the North, and that to-day the South can make as fine a grade of cloth as the northern mills. The employers are doing their share in making their employees contented. The environment of most of the southern mill towns, wholly under the control of the mill operators, is as attractive, satisfying, and elevating as that of any town of similar size in any part of the country. Some of the



AVERAGE RECEIPTS OF COTTON IN BALES

MARKETS	BALES	MARKETS	BALES	MARKETS	BALES
Galveston, Tex	2,456,271	Cincinnati, Ohio	195,111	Greenwood, Miss	123,104
Houston, Tex	2,334,338	Columbia, S. C.	180,631	Dallas, Tex	117,179
New Orleans, La	1,591,992	Brunswick, Ga	171,897	Clarksdale, Miss	99,740
Savannah, Ga	1,218,036	Wilmington, N. C	163,652	Montgomery Ala	95,161
Memphis, Tenn	1,158,751	Mobile, Ala	161,203	Boston, Mass	77,812
St. Louis, Mo	875,534	Macon, Ga	152,014	Greensboro, N. C	77,307
Norfolk, Va	461,914	Shreveport, La	142,550	Chickasha, Okla	75,254
Augusta, Ga	448,578	Greenville, S. C	140,433	Columbus, Ga	68,459
Charleston, S. C	285,056	Fort Worth, Tex	137,928	Baltimore, Md.	64,293
Texas City etc., Tex	281,728	Athens, Ga	135,301	Rome, Ga	60,114
Atlanta, Ga	266,360	Pine Bluff Ark	134,910	Selma, Ala.	57,623
Little Rock, Ark	202,504	Paris, Tex	123,135	Helena, Ark	51,936

COTTON
AVERAGE EXPORTS

PORT	BALES
Galveston, Tex	1,763,682
New Orleans, La	1,201,577
Savannah, Ga	764,252
New York, N. Y	624,185
Port Townsend, Wash	403,298
Texas City, etc., Tex	230,518
San Francisco, Calif	159,725
Brunswick, Ga	144,726
Wilmington, N C	124,880
Norfolk and Newport News, Va	98,717
Boston, Mass	95,767
Mobile, Ala	89,433
Charleston, S. C	87,134
Baltimore, Md	83,921
Pensacola, Fla	39,536
Philadelphia, Pa	27,339
Port Arthur, Tex	24,822
Other Points	213,008
Total	6,176,520

Courtesy U. S. Department of Agriculture.

FIG. 185.

The ports are the greatest cotton markets. Memphis and St Louis lead in interior markets.

towns are models. Good houses with attractive yards and large gardens, parks, recreation grounds, hospitals, schools, libraries, and theaters are being furnished at a low cost to the laborer; and surroundings of this sort attract people who have been accustomed to small tenant houses or mountain cabins. Such conditions tend to make contented workers.

Rise of Cotton Industry.—The modern cotton industry in the South dates from 1846, the year in which William Gregg, the first great Southern mill operator, constructed a large mill with 9000 spindles and 300 looms at Graniteville, S. C. Here were natural conditions especially favorable, for there were water power, river, and railroad transportation close at hand.

The textile industry, however, has long been carried on in the South, in most sections only in a small way. Hand spinning and weaving were common on all the plantations during part of the seventeenth and eighteenth centuries, and far into the nineteenth century in the mountain sections. On some plantations the cotton crop was marketed in the form of yarn, and some was used in the manufacture of coarse cloth for the plantation hands. In the back country where world commerce had not reached, the farmer folk were spinning flax, wool, and, in some sections, cotton for their home use, and even carried some of their products to the nearby towns. As late as 1890, and even 1900, a spinning wheel and a hand loom were occasionally seen in farmhouses. It took more than one hundred years after textile factories were made possible by Kay, Hargreave, Compton, Arkwright, and Cartwright for factory-made goods to replace homespun and home-woven goods in the South.

QUESTIONS, EXERCISES, AND PROBLEMS

1. There is every indication that the industrial frontier is moving into the South. Some people ascribe this movement to the cheap labor of the South, some to the tyranny of labor unions in the Northeastern States, others to the excellence of the geographic conditions favoring localization of industries. What do you think is the cause or are the causes? You must be able to present data for your decision.

2. Is the Negro a factor, directly or indirectly, in the development of manufactures in the South?

3. Where in the South, in the future, do you think will be located the larger industrial centers? You must decide what locations in the South are similar in water-power, coal resources, iron-ore deposits, land and water transportation facilities, and contact with markets to the industrial centers of the Northeastern States.

4. The coniferous forests of the South have supplied products to commerce and industry for more than three centuries. Make a thorough study of the forest-products industries and write a paper on the importance of southern forests in the economic life of the people, considering all forest products. For what reasons will the South become an important producer of paper?

5. Make a study of the dock and warehouse facilities provided by the Louisiana state commission at New Orleans. How do they compare with those at St. Louis? at Cincinnati?

6. It is claimed by some people of South Carolina that had the National Government spent as much money in harbor improvements at Charleston as at New York, Charleston to-day would be as large as New York. Construct curves of the population growth of both cities. Data may be secured from the Statistical Abstract or the Census Reports. What geographic and historical factors can you find to explain the differences in the growth of these two cities? What competitors does Charleston have in the South?

CHAPTER XVI

THE PHYSIOGRAPHIC REGIONS OF THE WEST

MOUNTAINS and plateaus dominate the topography of the West. Very little of the area may be considered as plains; even the Great Plains area is considered by many a plateau. Since the plateaus are highlands between mountains or border the mountains, it is the trend of the major mountain systems that determines the trend of the topography. The trend, or the grain, so to speak, of the topography is roughly north and south. Four major physiographic regions are recognized: the Pacific Slope, the Intermontane Plateaus, the Rocky Mountain System, and the Great Plains. (Fig. 186.)

The Pacific Mountain System.—The Pacific Mountain System consists of two rows of mountains, the Coast Ranges on the west, and the Sierra Nevada—Cascade Mountains on the east, and a long valley trough between. The valley trough, however, is interrupted by a mountain mass, the Klamath Mountains, in southern Oregon and northern California, and thus two troughs result, the Puget Sound Trough in the north and the Valley of California, or the California Trough, in the South. South of 34° N. is a third trough, the Salton Sink Trough, the landward continuation of the Gulf of California depression. Although from a physiographic standpoint the Gulf of California depression forms a part of the great Pacific Slope depression which extends from Lynn Canal in Alaska to the tip of Lower California, Salton Sink is generally classed as a basin of the Basin and Range Province, and will be so considered in this discussion.

The Coast Range of Oregon and Washington.—The Coast Range of Oregon and Washigton is low, and is largely a dissected, warped plateau, broken by many rivers. It is a region of rough topography, ill suited for agriculture, except in its valleys, but well adapted to the growing of forests, the oceanic climate being particularly favorable to plant life.

The Klamath Mountain group, which may be considered a part of the Coast Range, for it touches the coast, is a plateau, so thoroughly dissected by the several short, swift rivers that enter the Pacific between 41° and 43° N. that nearly the whole area is in slope. Ridges and peaks

are the rule, but erosion has progressed sufficiently to haye formed many valleys broad enough to encourage agriculture. The group is a distinct barrier to traffic and communication between the Puget Sound and California troughs. (Fig. 188.)

The Coast Ranges of California.—Southward from the Klamath Mountains to the latitude of Los Angeles, the coastal mountains consist

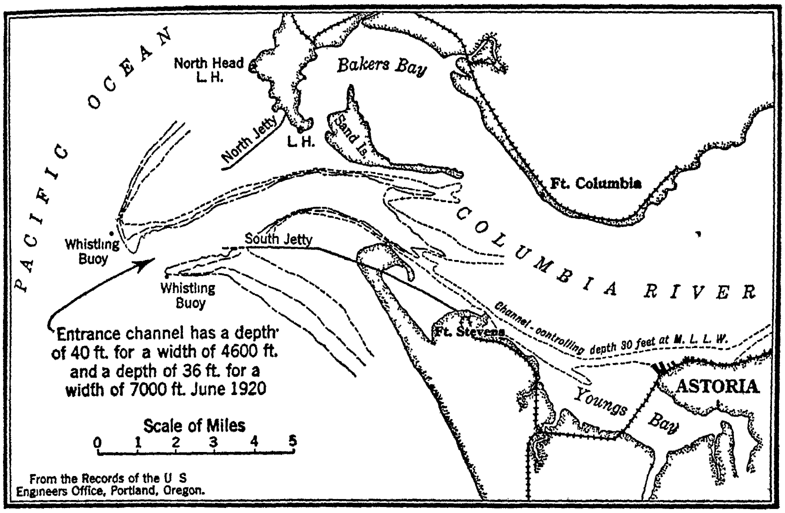
FIG. 186.—The Physiographic Regions of the West.

The major divisions are largely based on the monograph of the physiographic divisions of the United States by Fenneman and others.

of a series of parallel ranges, some short, some long. Each of the numerous headlands that characterize the California coast is one of these ranges projecting into the Pacific. The broad, open bays between headlands are, as a rule, the seaward ends of valleys that lie between the ridges. None of the bays, except San Francisco Bay, furnishes shelter to ships; and the high, bold cliffs and strong on-shore winds at times make the entire Pacific Coast a foreboding one to the mariner.

San Francisco Bay, one of the finest harbors of the world, occupies the drowned portion of a structural depression between two ranges, and the entrance to the bay, Golden Gate, is a drowned valley in the outer range. There is also a break through the inner range, so that ocean-going vessels tie up at wharves on the very edge of the Valley of California. The long shoreline of the bay gives ample room for the expansion of the numerous cities.

Southward from Los Angeles, the coastal mountain region consists of a number of short, low ranges, the more prominent being the Santa Ana



Map prepared by Portland Chamber of Commerce.

FIG. 187.—Entrance to Columbia River.

Captain Gray in 1791 entered the mouth of this river and named it the Columbia, the name of the ship which he commanded in 1790, the first ship to circumnavigate the globe under the American flag. Captain Vancouver, sailing under the British flag, considered the shoals off the mouth of the river too dangerous for his ship and thus left to the Americans the honor of discovering the mouth of the Columbia. How have the jetties deepened the channel at the mouth?

and San Jacinto. The valleys between the ridges are partly waste-filled. The harbors at San Pedro (Los Angeles harbor) and San Diego are on the outer edge of the coastal plain bordering the Coast Range. In their present condition they are more the work of man than of nature. (Fig. 189.)

Little of the land of the Coastal Range Province is cultivated, largely because of the dominance of slope. In most of northern California and in Oregon and Washington, the dairy farmer and fruit grower have made a start but the lumberman still holds sway over a large area. Southward from 39°, aridity in general limits the cultivable lands to the irrigated valleys.

The Puget Sound Trough.—The Puget Sound Trough extends from the Canadian border southward to about 43° 30′ N. The northern part of the Trough is occupied by Puget Sound, which is bordered by sandy, gravelly plains, and hills, largely glacial and fluvio-glacial in origin.

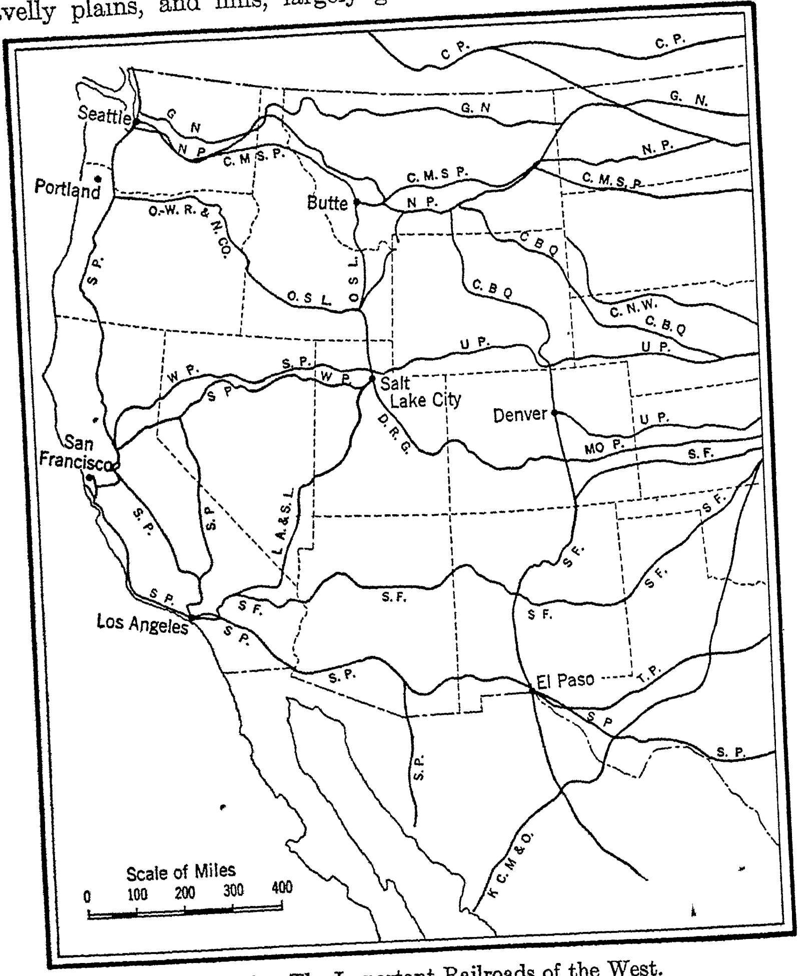


FIG. 188.—The Important Railroads of the West.

Railroad building in the West began with the Union and Central Pacific in 1869. The union of these two lines was made near Salt Lake City. Much of the freight carried is "through traffic" from the humid Pacific slope to humid East. East and west lines dominate. The Pacific Trough and Rocky Mountains have lines north and south.

The southern limit of the glaciated area is about fifteen miles south of the southern end of the Sound. The enterprising cities of the trough give a profitable market for the garden truck, dairy products, and deciduous fruits produced on the humid plains bordering them.

Puget Sound is another of the fine harbors of the world; in fact, it is a group of harbors all connected by deep water. The linear distribution of the water surface, mainly transverse to the prevailing winds, and the numerous bordering hills give shipping excellent protection from the wind and waves. Moreover, the harbor is open the year round. The Sound is the result of drowning of the northern end of the Puget Trough; in fact, it is the beginning of the long "Inside Passage" that extends northward to Alaska. Glaciation, too, has had its part in widening and deepening the channels of the sound.

The Willamette River, which drains the trough in Oregon for most of its course, is an aggrading stream. It flows through a broad, alluvial

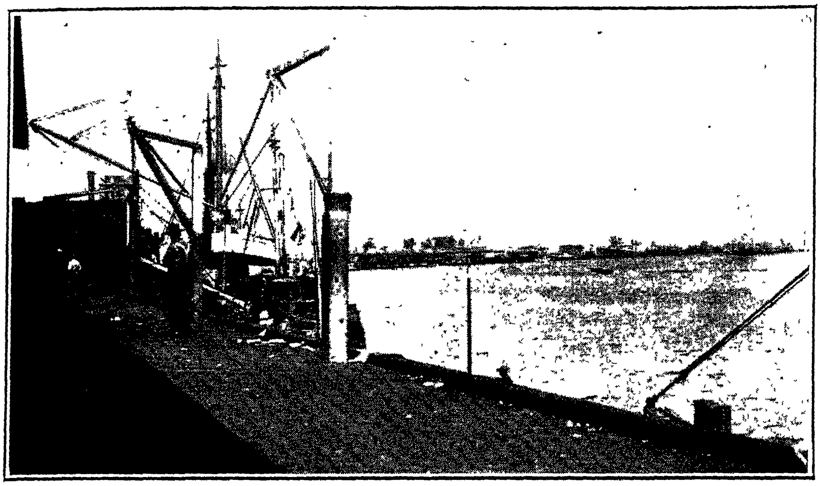


Photo by Parkins.

FIG. 189.—The Harbor of Los Angeles (San Pedro).

In the lower course of the Los Angeles River numerous turning basins and slips have been dredged deep enough to accommodate the larger ocean-going vessels. The dredged material is used to fill in the marshes bordering the river, thus giving sites for factories. Thus Los Angeles has made a harbor that is attracting an increasing amount of commerce.

plain, 10–15 miles in width in places. Here are to be found the most highly productive portions of Oregon, in fact, some of the best humid farming land in the West. Most of the agricultural land of the trough in Oregon lies on the flood plains of the Willamette, for much of the bordering rolling land and the tributary valleys have been cleared. The chief trading center of the Willamette Valley is Portland, which though 120 miles inland, is yet an ocean port. (Fig. 187.)

The Valley of California.—The Valley of California, 400 miles long and 30–60 miles wide, is drained by two large rivers, the Sacramento and the San Joaquin, and their tributaries. Even in the northern portion

the rainfall is not sufficient for humid agriculture, and the southern portion is a bunch-grass-covered semi-desert except where irrigation is practiced.

The valley trough is structural, its formation being associated with the tilting that formed the Sierra Nevada and the warping that gave rise to the Coastal Ranges. A long, narrow sea probably once occupied the trough, but alluvial deposits in the form of fans and flood plains have displaced the sea. Deposition is most active along the eastern border of the valley where the swift, copious streams on the western slope of the Sierra Nevada bring down large quantities of detritus and form compound alluvial fans. Much of the surface of the valley to the west of the fans is a dead-level plain on which drainage of even the slight rain is slow and difficult. Marshes are common, the largest being at the junction of the Sacramento and San Joaquin rivers, about Tulare Lake, and near the Marysville Buttes. The deep soil and flat surface of the valley offers excellent conditions for agriculture where the rainfall is sufficient for dry farming, or where water is available for irrigation; and for the latter the many copious streams from the Sierras are utilized. The tilled land of the northern half of the valley is largely dry-farmed; that of the southern half is mostly "under ditch."

The Sierra Nevada—Cascade System.—The Sierra Nevada and Cascade mountains do not form a continuous system. There is a gap in the system in the vicinity of the Feather and Pitt rivers, and here are Mt. Shasta and Lassen Peak, both volcanic in origin, the latter still being active at times.

The Cascade Mountain region is an elevated upland (probably an elevated peneplain) of sedimentary and granitic rocks above which rise numerous volcanic peaks, the more prominent being Baker, Rainier, St. Helens, Adams, Hood, Jefferson, Pitt, Shasta, and Lassen Peak. Not all the eminences, however, are volcanic in origin; some are monadnocks on the old peneplain surface. In places the Cascades are 60–80 miles wide. While there are large flat areas on the crest of the main axis, erosion has formed deep valleys on the borders. In the northern section, glaciation has deepened a few of these valleys, the Lake Chelan valley being the most conspicuous example of this type. Some of the valleys on the eastern slope and bordering lowlands, more easily reclaimed than those on the west because of the scantier forest growth, have become famous as fruit-growing sections. Such are the Wenatchie, the Yakima, and the Hood River valleys.

The Cascade Range is much more broken in Washington than in Oregon. Not only do the railroads find fairly easy grades to tunnels through the breaks in the range, as at Snoqualmie Pass, Stevens Pass

(Cascade Tunnel), and Stampede Pass, but the westerly winds carry moisture over the range to the Columbia Plateau in Washington, Idaho and Oregon in quantities sufficient to make the raising of wheat by dry-farming operations possible. The large area of farm lands of southeastern Washington contrasts strikingly with the nearly worthless desert areas of southeastern Oregon, and this contrast is partly the result of differences in mountain heights and the resulting differences in rainfall.

The Sierra Nevada Range is a huge tilted block, the uplift occurring along the eastern portion of the block. The eastern face is steep; the western slope is gentle but roughened by many deep gorges produced by glaciers and rivers. Some gorges are rift valleys. Southward from the latitude of Sacramento nearly to 36° N., the Sierra block rises to 10,000 feet or more. This is the High Sierras, a region of great beauty and ruggedness with many lofty peaks ranging from 12,000 to more than 14,000 feet.

The Sierras are a barrier to the movements of man, for the passes are few and the entrances to them are far up on the flanks of the mountains, 7000–9000 feet above sea level. It was only after long and diligent search that the pioneers in the forties of the past century found feasible routes across the mountains.

The Sierras are also a climate barrier. Greater contrasts on the east and west sides of the range in rainfall and temperatures are probably not found in any other part of the world except in the Himalayas. In crossing the Sierras along the Southern Pacific from Reno, one passes from the bleak sagebrush desert, where the annual rainfall is but 8.65 inches, up into fine forests which are a response to abundant rains. Blue Canyon station on the western slope of the mountains, at an elevation of 4701 feet, has a rainfall of 74 inches. The temperature regions traversed also indicate great contrasts. (Study Fig. 5.) The plateau to the east of Reno is in the **Hot Summer and Cold Winter** temperature region. In going up over the mountain range one passes through the **Cold Winter and Mild Summer** belt on the summit and upper slopes into the **Cool Winter and Mild Summer** region on the western slope, and then down into the **Hot Summer and Cool Winter** region of the valley.

The Intermontane Plateaus.—The Intermontane Plateaus Region, covering the vast area between the Sierra Nevada-Cascade system and the Rocky Mountains, is naturally divided into three subdivisions: the Columbia Plateau, the Basin and Range Province, and the Colorado Plateau. Each has its distinct type of topography.

The Columbia River Plateau.—The Columbia Plateau, with an area of about 250,000 square miles, has for its bed rock horizontal layers of lavas, which evidently came out of numerous vents at various times,

and spread over large areas, burying in most parts the old land surfaces. In some deep canyons in the plateau, one hundred distinct layers, representing one hundred outflows, may be seen. A few areas, like the Blue Mountains, are higher than the surface of the lava beds and stand like islands surrounded by a lava sea. Weathering, in which physical processes predominate, combined with active wind transportation, has covered the area with a deep soil, dark in color, and highly productive, where moisture is sufficient. The Palouse Region in Washington, western Idaho, and Oregon has a dark soil, porous and fine enough to retain a large part of the scanty supply of rain water and give it up to the wheat crop, the dominant agricultural product of the region. The soil of the Palouse country is in color and physical characteristics like that of the eastern edge of the Great Plains.

The Columbia and its tributary, the Snake, are the largest rivers of the Plateau. Although serving as rather important highways of travel and transportation in the past, their chief value to-day is to furnish water for irrigation and hydroelectric power. The Columbia is one of the greatest salmon streams in the world.

The Basin and Range Province.—The Basin and Range Province is the largest of the Intermontane Plateaus extending from about 42° N. to the southern boundaries of the United States, and eastward from the Cascades and the Sierra Nevada ranges to the Rockies, and from the Coast Range in southern California through Arizona and New Mexico to the Great Plains beyond the Rio Grande. The surface features throughout the entire area are very similar, consisting of numerous short ranges and vast stretches of waste plains, the material of which has been deposited by water and winds. Throughout its extent the Basin and Range Province is a region of scanty precipitation; the occasional rain that comes falls in a heavy downpour. It is the most arid of the provinces in the West. The scant rainfall and rapid evaporation and its topographic features are typical of desert lands. All of this Basin and Range Province, west and north of the Colorado River, lies in the Great Basin, an area of interior drainage. The Great Basin is really a region of basins, the more prominent being the Great Salt Lake Basin, the Carson Sink area, Death Valley, Salton Sink Basin, and the Lower Colorado Basin.

Great Salt Lake is the shrunken remnant of a large lake, Lake Bonneville, whose surface during the Glacial Period stood a thousand or more feet above the present level, and which was comparable in area (19,750 square miles) to Lake Michigan. Lake Bonneville was a fresh-water lake, the drainage going northward into Snake River. The terraces of the ancient lake are to be seen as huge benches high on the slopes of the

Wasatch Range and the mountains on the western border of the lake basin. The present level of the lake varies from time to time, depending on the relative amount of rain.

With the constant shrinkage that has been going on for thousands of years there has been a concentration of the mineral compounds, until now the water is so salty that animal life is almost precluded, the only permanent life being a small "brine shrimp." Another form seen at some seasons is the larva of a small fly. The water is so dense that bathers can float on the surface nearly as easily as a cork floats on fresh water. The Carson Sink Basin was also once partly occupied by a large lake in the Glacial Period, Lake Lahontan, the waters coming from the glaciers in the High Sierras.

Salton Sink Basin is the remnant of an arm of the Gulf of California which has been isolated by the formation of the Colorado River delta. In late years the basin has come to be called the Imperial Valley and is one of the most productive irrigated areas in the West. The surface level of the lake in 1921 was 248 feet below sea level. It is easy, therefore, to secure water for irrigating the land about the Salton Sea from the Colorado River. In 1891 and again in 1905, during periods of high water, the Colorado, to the extent of about 85 per cent of its volume, became diverted toward Salton Sink along a diversion canal which was not provided with gates, and it was only after much effort and at great expense that the flood waters were again directed toward the Gulf and protective dams constructed. Because of its southern location, and the fact that it is in a normal high-pressure area with bright sunlight, the Basin raises all the sub-tropical crops of both the New World and the Old.

Besides these large basins there are scores of minor basins within the Great Basin that receive the water from the nearby low ridges or surrounding plateau surfaces, and which, during moist periods, are occupied by water that evaporates in dry periods and leaves salt or alkaline incrustations or mud flats. Such lakes are known as salinas, alkali lakes, and playas, respectively.

Most of the ranges of the Basin and Range Province, particularly the shore of the Great Basin, are the fault-block type of mountain, the height and form of which have been greatly modified by erosion. The axes of the ranges are more or less parallel, and all have a north-south trend. About each range are large flat areas of loose mantle rock, spread out in sheets over the volcanic bed rock, by wind and water. In California, Arizona, and New Mexico, plains occupy more of the surface by far than mountains. In the Lower Colorado Basin, nearly 90 per cent of the area is flat or nearly flat land, and thus large areas are topographically suitable for irrigation.

Except in the Humboldt River basin, in the Carson Sink area, and the Imperial Valley, there is little irrigation in the Great Basin, for water is very scarce.

The Colorado Plateau.—The Colorado Plateau, the third division of the Intermontane Plateaus, is higher than the Basin and Range Province. Although there has been some faulting and movement of blocks, little tilting and practically no folding has occurred. The plateau is characterized by deep gorges. The highest portion of the plateau is a broad zone along the western and southwestern edge from central Utah on into New Mexico. The rainfall over much of the plateau is sufficient to grow a fair supply of grasses and edible weeds for

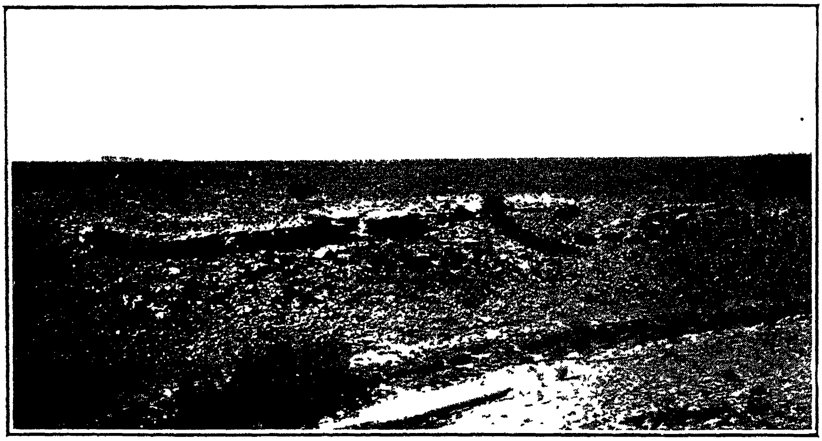


Photo by Parkins.

FIG. 190.—The Colorado Plateau North of Williams, Arizona.

The monotonous plateau level is broken here and there by low hills and shallow valleys. After rains this area furnishes much fodder, for a time. One of the great needs of the West is an animal that can thrive on sagebrush.

summer grazing. The higher portions of the plateau have enough moisture for a good stand of pine, and are largely held as national forests and lumbered under the direction of the Forest Service. (Fig. 190.)

The canyons of the Colorado, the Grand Canyon being the most impressive, are probably the most conspicuous topographic features of the Colorado Plateau and are distinct barriers to communication and transportation.

As a whole, the Colorado Plateau Province is thinly settled. There are a few rather progressive little towns, whose economic life depends on mining, repair work at railroad shops, lumbering, and grazing. Agriculture, necessarily based on irrigation, is little practiced except in west-

ern Colorado and central Utah near the headwaters of some of the tributaries of the upper Colorado River. Grazing is the leading industry, the stations along the Santa Fé, the only railroad of the plateau except the Denver and Rio Grande in the far north, receiving cattle from ranches scores of miles distant. The Indians on their reservations are among the most active of the pastoralists.

The Rocky Mountain Province.—The Rocky Mountain Province is a broad elevated tract 1200 miles long and 200 miles wide, on the average. It is made up of a large number of more or less parallel ranges, few of them more than 200 or 300 miles long, separated by numerous valleys and basins. Like the Sierra Nevada–Cascade system, the Rocky Mountain system is divided into a Northern Rocky Mountain Province and a Southern Rocky Mountain Province, separated by a stretch of lower land in Wyoming, known as the Wyoming or Great Divide Basin. The Wyoming Basin is topographically a continuation of the Great Plains to the east and the Colorado Plateau to the south. Because of the easy approach from the east and the low passes across the Rocky Mountains, the routes of the earliest overland trails and the first trans-Rocky Mountain railroad were located in Wyoming. (Location also a factor.)

The Northern Rockies.—The northern Rockies are widest in Montana, and here are the largest number of ranges—the Big Belt, Little Belt, Gallatin, Lewis, Mission, Kootenai, Cabinet, and others. In the vicinity of Yellowstone Park the system is narrow, but southward several ranges spread out fan-like from the lofty Yellowstone Park plateau. The courses of the rivers are determined only in part by the mountain ranges and the trenches. Some streams flow across the trenches and cut through mountain ranges with little regard to the trend of the major topographic features. It is this condition that makes the Northern Rockies in Montana so easily, comparatively speaking, traversed by the trans-Rocky Mountain railroads. Civilization is concerned chiefly with the valleys, basins, and trenches; here are the agricultural lands, the cities, and railroads. The mountains, owing to the moderate rainfall and low evaporation, are well forested and are little visited except by hunter, trapper, lumberman, or forester. The forested mountains are of inestimable value to the irrigation farmers of Montana.

In central Idaho, to the west of the Bitter Root Range, is a large mountain mass, produced by the intensive erosion of a high plateau. There is little or no system to the ridges except that their direction bears a fairly definite relation to the drainage lines, the result of erosion. Those in the Clearwater River basin are called Clearwater Mountains, and the Salmon River group lies in the Salmon River basin. The many canyon-like valleys give little opportunity, even though the rainfall is

sufficient, for agriculture. Through railroads have shunned the region. The whole area, more than twice the size of Massachusetts, has only about 20,000 people.

The principal ranges in northern and western Wyoming are the Absaroka, the Shoshone, the Big Horn, the Wind River, and the Teton. Between the Absaroka Range and the Big Horn Mountains is the Big Horn basin. Although the rainfall is less than 10 inches a year in the basin, it is irrigated by numerous streams that come from the bordering mountains, and the 308,000 acres of irrigated land are highly productive. South of Yellowstone Park and at the east base of the Teton Range, is Jackson Hole, an intermontane basin that contains Jackson Lake and several smaller lakes which drain into the Snake River. Forests, marshes, and lakes serve as regulators and natural storage areas for most of the water that irrigates the many hundred thousand acres along the main course of the Snake in Idaho, Oregon, and Washington. The Big Horn Mountain group is similar in general character and origin to the Black Hills and the Uinta Mountains, all three being domes more or less dissected.

Another important range of the Northern Rockies is the Wasatch in northern Utah. The great longitudinal extent of the Wasatch Range and its height of 4000–6000 feet above the Great Salt Lake plains on the west, and the steep slopes, give many difficulties to the railroad and road builders. Fortunately, a few antecedent streams have cut gorges across the range, and these offer feasible routes. The Oregon Trail avoided the range, making a sharp turn to the north at its eastern base, but the Mormon Road crossed it in the latitude of Salt Lake City, through Emigrant Pass. The Denver, Rio Grande and Western Railroad reaches the Great Salt Lake plains by way of the Spanish Fork, and the Union Pacific through Weber Canyon. The chief value of the range to man, besides its mineral resources, is the water which falls on its western slopes and which has been directed with great skill upon the thirsty sagebrush piedmont plains. In 1919 there were 571,000 acres of irrigated land at the base of the Wasatch, carefully tilled and highly productive, a vast oasis in still vaster stretches of sagebrush and greasewood desert plains.

The Southern Rockies.—The Southern Rocky Mountain Province is, throughout its length, a double row of ridges with basins between. The two ridges are remnants of two more or less continuous parallel folds with a synclinal depression between. Erosion has removed most of the sedimentary rock from the ridges, exposing the igneous cores; but sedimentary material is to be found in the hog backs on either side of the ranges and in the intermontane basins.

In southern Wyoming, the Laramie Range, the eastern front range, is a low, folded mountain. The summit is a gently rolling peneplain. The approach from either side of the crest at Sherman (8009 feet) is very gentle. The Union Pacific Railroad crosses it with low grades. To the west of the Laramie Range, in southern Wyoming, is the Medicine Bow Range, and between the two is the broad Laramie Basin or Plains.

The Front Range in Colorado is the easternmost range, as the name implies. Its serrated crest and towering peaks, which rise 13,000–14,000 or more feet above sea level, may be seen from points on the High Plains scores of miles distant. Pike's Peak has an elevation of 14,110 feet, and Long's Peak is 14,225 feet. Much of the summit of the Front Range, as seen from an elevated position like Pike's Peak, is an upland cut by many deep canyons, yet also with a large acreage of relatively flat land and capable of supporting large flocks and herds during the warm season. Glaciation has been active in the past. Cirques, lakes, and moraines are common features in the upland areas and add much to their picturesqueness. The Front Range extends only to the Arkansas River, beyond which the Wet Mountains become the front range. Farther south, the Sangre de Cristo, which extends on into New Mexico even beyond Santa Fé, is the easternmost range.

The western series of mountain ridges of the Southern Rocky system is formed by the Park Range, the Sawatch, and the San Juan mountains. There are a few other ranges in west central Colorado that belong to the Southern Rocky Mountain system, but they are of minor importance.

The small intermontane basins of the Rockies, called "parks," are, from north to south, North Park, Middle Park, South Park, and San Luis Park. On the eastern slope of the Front Range is Estes Park, much visited by tourists. The parks, although they lie between prominent ranges with their north and south rims much lower than the east and west mountain borders, are isolated from each other, and their drainage waters take devious routes. North Park drains into the Platte by way of the North Platte River. The waters of South Park pass eastward through Royal Gorge, carved in the front range by the South Platte; and San Luis Park is drained by the Rio Grande.

The basin floor of the parks is fairly level, the basins being waste-filled; but Middle Park has a hilly surface. San Luis Park, the largest offers exceedingly attractive opportunities for agriculture. Its surface is as level as the bed of a lake, and the land is easily irrigated and easily drained.

Colorado has by far a larger number of lofty peaks and a larger area

of land above 10,000 feet than any other state. There are 180 peaks that exceed 12,000 feet in height, more than 110 above 13,000, and about 40 that rise to heights of more than 14,000 feet. The large area of high land athwart the eastward drift of the air in the *Westerlies* is the explanation for the relatively heavy rainfall, which makes possible the large area of valuable commercial timber and supplies water to the 3,350,000 acres of land that have been irrigated in the state, as well as to many thousands of acres beyond the borders. Colorado, although an interior state 700 or more miles from the Pacific, ranks second among the states of the West in number of acres of land irrigated. The mountains and ridges, however valuable they may be to the timber industry and agriculture, indirectly, are a barrier to east and west traffic; and the railroads that do cross the Rockies in Colorado have spent huge sums in bridging canyons and tunneling mountains. They make frequent use of " horseshoe " curves in order to reduce grades, yet their traction costs are heavy.

The Great Divide Basin.—The Wyoming or Great Divide basin, surrounded on almost all sides by ridges of mountains, receives less than 10 inches of rain. (This is approximately the rainfall of the Green River basin, the Big Horn basin, and the Wind River basin in Wyoming also.) It has all the characteristics of a true desert. The streams that flow from the surrounding ridges lose themselves in the sands, or their waters spread out into flats that become playas or salinas. Near the western edge of this basin and in the lowest portion, is the Red Desert, an area of drifting sand of various colors—vermilion, brick red, and russet, even green, purple, gray, and yellow. The bunch grass is so scant and so scattered that the color of the landscape is determined largely by the colors of the sands that nearly everywhere mantle the surface. Barren and desolate as the landscape is, there are periods of the year, particularly in the winter, when large herds of cattle and sheep find pasturage.

The Great Plains.[1]—The Great Plains Province is undoubtedly, next to the Coastal Plain, one of the most unified in surface features of the physiographic provinces of the United States. Its north and south extent is about 1400 miles and its width approximately 400. Could its original surface be restored, it would be a gently sloping plain, not unlike the Atlantic Coastal Plain, in many of its features. The rock material

[1] Only the western edge of the Great Plains Province is within the Western States as delimited by the Census Bureau, but considered from the standpoint of climate and land utilization the whole province may be included in the West. In the minds of the general public it is western. In this text the Province is discussed along with the other natural regions of the Western States, but census data, unless otherwise stated are for the eleven states that the Census Bureau calls the West.

forming its strata has been derived largely from the Rocky Mountain area to the west. The lower strata of sandstone, shales, and limestones dip gently eastward, but are synclinal in structure, and at the western edge are sharply upturned, particularly in Colorado (in the Garden of the Gods they stand almost vertical) as if they once extended over the exposed core of the Rocky Mountains. On the top of these older consolidated deposits are younger sands, gravels, and mud, only partly indurated. These, too, slope eastward. Erosion in some parts has been very active, probably amounting to several thousands of feet. The western border at present has an elevation of about 6000 feet A. T. in the central or Wyoming-Colorado region, and 4000 feet to the north and south.

North of the northern boundary of Nebraska, more exactly the Pine Ridge Escarpment, the Great Plains slope all the way from the mountains, with little or no interruption except for a few isolated hills whose flat tops indicate the level of the former surface of the plain, to the Missouri River. This portion of the province is the Missouri Plateau. The eastern edge of the plateau is the Missouri Coteau, an escarpment 200–600 feet high in places. North and east of the Missouri River the plateau has been under the ice of the Keewatin ice sheet and has typical morainic topography. Although the Missouri Plateau has no more rain than the Great Plains farther south, the cooler summer temperature does not make for excessive evaporation in much of the area, and dry farming is fairly successful. The rivers from the Northern Rockies supply much water for the irrigation of lands in the Missouri Plateau.

South of the Pine Ridge Escarpment, three distinct types of topography are recognized in the surface features of the Great Plains. These are arranged in north and south belts. The central belt, in which much of the original strata of sand and gravel are preserved and which stands higher in general than the belts east and west, is the High Plains. (Fig. 191.) In most of Nebraska the High Plains extend across the Great Plains Province, but farther south the belt is only about 200 miles wide. In western Texas the High Plains are known as the Llano Estacado, and farther south as the Edwards Plateau. To the east of the High Plains are the Low Plains, the line of separation being in general a low escarpment called the Break of the Plains. Erosion is more rapid along the western edge of the Low Plains than in the most of the High Plains, because the rainfall is greater. The streams are constantly shifting the western boundary as they erode into the steeper lands at the Break of the Plains.

Along the western edge of the Great Plains between the High Plains

and the Rockies, is a long, narrow strip more or less continuous, in which erosion has been active and which has formed a series of troughs or holes, or basins, not unlike an "inner lowland." In western Nebraska is the Goshen Hole, carved by the many tributaries of the North Platte. In Colorado is the Colorado Piedmont, eroded by the South Platte and the Arkansas and their tributaries; and in New Mexico and western Texas is the Pecos Valley. All the major streams and some of the tributaries in the inner lowland belt are supplied with water from the mountains, and are therefore able to erode actively. The bed rock in this area, in the early part of the present cycle of erosion, was higher than that to the east, and, as in all "inner lowland areas," was subject

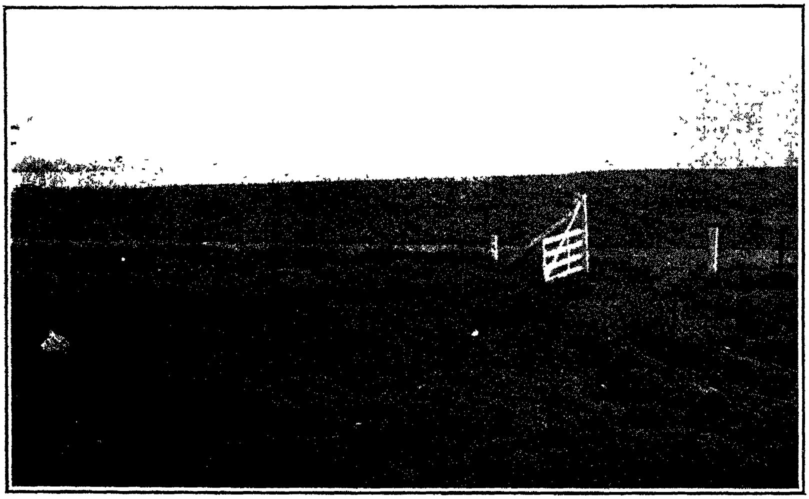


Photo by Parkins.

Fig. 191.—A Landscape in the High Plains of Western Kansas.

Short bunch grass is the dominant vegetation except in the moist season, then there is a great variety of plants. The trees in the left background are along a stream.

to rapid erosion. The upturned edges of some of the strata present points of attack for weathering agencies. Moreover, the plant life is scanty and thus does not form a protective cover against erosion, as it does farther east. These are probably the reasons for the formation of the "inner lowland" areas.

The Great Plains Province has the largest area of continuous agricultural and grazing land in the West. The Province is a transition zone between the humid East and the arid West, a transition zone in topography, soil, climate, plant life, and land utilization. For this reason the boundaries delimiting it as a whole, or delimiting its divisions, are open to dispute. Its western boundaries and the boundaries of its

three divisions are fixed readily by natural features, but the eastern limits are located more or less arbitrarily. The soil student recognizes the western boundary as decided on by the physiographer, and for the eastern boundary uses color of soil as a criterion. The latter criterion delimits the divisions. Three belts or divisions are recognized: an eastern Black Earth Belt; a middle Dark Brown Earth Belt; and a western Brown Earth Belt. The amount of humus in the soil, which affects the color, decreases westward. Soil profiles show, on the other hand, an increasing amount of calcareous material in the soil, increasing in percentage and thickness but decreasing in depth toward the west. This calcareous layer measures the depth of root penetration. Both color of soil and depth and thickness of calcareous layers are responses to the amount of rain and the depth to which the rain penetrates. The Black Earth Belt lies in general to the east of the 20-inch isohyet.

The ecologist recognizes three belts of plant formation; and the agriculturist, three belts based on man's utilization of the land. In the Black Earth Belt grain growing dominates the agricultural activities, with live stock raising subordinate. In the Dark Brown Earth Belt farming is less certain than in the belt to the east, and live stock often tides the farmer over lean years. This is, therefore, a farming-grazing belt. In the westernmost belt, grazing predominates.[2] (Fig. 191.)

QUESTIONS, EXERCISES, AND PROBLEMS

1. Do you think the railroads of the West are justified in advising Americans to "See America first"? List the "natural wonders" of the West visited by tourists. Of what economic value to the West are these recreation grounds To what extent has the National Government contributed to the recreation business of the West? Make a list of the national parks and monuments. What are the natural features in each that attract people? Write to the Department of the Interior, Washington, D. C., for booklets on National Parks and Monuments. What types of business in the West are benefited by the tourist trade?

2. Plan three journeys across the Western States, one in the North, one along the Overland Route to California, and one in the South. Write descriptions of or reports on the more important natural geographic features and human activities that one would see along each route. Consult the "Guide Books of the Western States," listed in the bibliography.

3. What physiographic features located the first railroad to the Pacific Coast along the central route? See the "Guide Book of the Overland Route."

4. Make a study of the natural features of Puget Sound, the lower Columbia River, and San Francisco Bay as harbors. Make detailed sketches. How did Los Angeles provide for a commercial contact with the Pacific? What adverse conditions did it overcome?

[2] See series of articles on Great Plains in Annuals of the Association of American Geographies, listed in Bibliography.

CHAPTER XVII

THE CLIMATE OF THE WEST

THE dominating factor in the geography of the West is aridity. Its influence is seen in many ways: in the topographic forms, in the chemical composition and physical characteristics of the soil, in the character and distribution of plant life, in man's utilization of the land, in the architecture of the homes, the density and distribution of population, the wealth of the people, and the distribution and mileage of roads and railroads. In this chapter will be discussed the distribution of rainfall and temperatures, climatic plant geography, land utilization, and density and distribution of population.[1]

RAINFALL

Areas of Rainfall Regions.—The West, as delimited by the Census Bureau, has an area of 1,189,000 square miles; but if aridity be taken as the criterion, the eastern boundary is the 20-inch isohyet, or approximately the 100th meridian. This larger West has an approximate area of 1,300,000 square miles, more than two-fifths of the area of the continental United States, exclusive of Alaska.

Of this vast area, only about 135,000 square miles, mainly the Pacific Slope north of 37° and north central Idaho, have a rainfall of 30 inches or more, the amount generally considered essential in intermediate latitudes, if well distributed seasonally, for the more productive phases of humid agriculture. Much of this area is too rugged to be utilized for large-scale agriculture as now practiced in the United States. Even within the region commonly considered as the humid portion of the Pacific Slope, some of the valleys, particularly in southern Oregon and northern California, in the rain shadow of the Coast Range, are semi-

[1] In no section of the United States is human adjustment to climatic conditions quite so evident as in the Western States. In northern Canada and the West, climatic influences are so all powerful that they approach controls. It is for these reasons that a chapter is being devoted to the Climate of the West instead of making climate incidental to the other phases of the geography as is done in most other sectional treatments.

humid and require irrigation for profitable agriculture. About 900,000 square miles (some 70 per cent) have 10–20 inches of rain a year; and 240,000 square miles (about 18 per cent), less than 10 inches. More than 60,000 square miles are absolute desert.

Generalizations as to Rainfall Regions.—The distribution of rainfall and its causes have been discussed in Chapter II. Only a few generalizations need be made here. In general, in much of the West, the quantity of rainfall is a function of the altitude and location with respect to the ocean and winds. The regions of heavy and of very heavy rainfall, 40 inches or more, are on the westward facing slopes of the Coast Ranges and the Sierra Nevada–Cascade Mountains, north of 37°, approximately. North of 39°, most of the higher slopes of the mountains receive 60 inches or more, and a few small areas 100 inches or more. Areas having 30–40 inches are to be found in Idaho north of 44°, and on a few of the higher mountain masses in Colorado. Most of the 20–30-inch areas are on mountains and plateaus of moderate elevation, as in California south of 37°, in Arizona, Colorado, Wyoming, Montana, and Idaho. In general, the basins or lowlands in the lee of the higher mountains, and plateaus have less than 20 inches of rain. (Figs. 192 and 193.) The large area that lies between the Pacific mountains and the Rockies, with the exception of a plateau area near central Arizona and a mountain area in northeastern Oregon, is one of great aridity. The climatic deserts are in portions of the less-than-10-inch rainfall areas.

The seasonal distribution of rainfall, as earlier discussed, is a factor of large importance in plant growth, both native and cultivated. On the whole Pacific Slope, west of the Sierra Nevada–Cascade Mountains, and on a part of the Intermontane Plateau to the east, 30–50 or more per cent of the rainfall comes in the fall and winter months. In this large area the growing season is relatively dry. This is particularly the condition over the largest part of California, most of which has 50 per cent of the rain in the winter months. The summer droughts affect not only the plant life but also the constancy of the water supply for domestic use, for irrigation, and for water power. In most of the remaining area of the West the rain comes in summer or early spring or is more or less evenly distributed throughout the year.

TEMPERATURE

The great range in altitude and latitude and the wide longitudinal extent from the shores of the Pacific to the interior of the continent are the reasons for the great variety of temperature types. (See Fig. 5 and the discussion on page 20.) One of the striking characteristics of

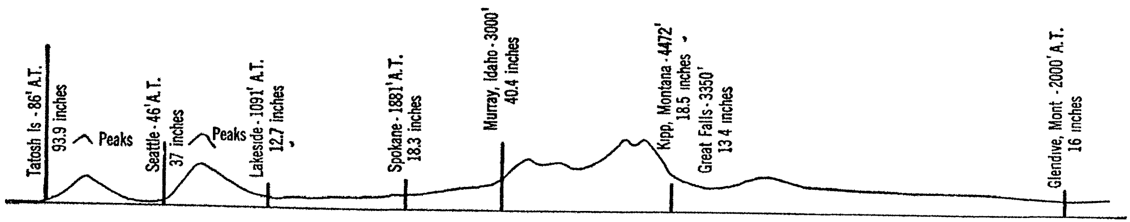


FIG. 192.—Rainfall Along an East–West Section from Seattle to Great Falls.
What effect do slope and location of lowlands with respect to ridges and mountains have on the amount of rainfall?

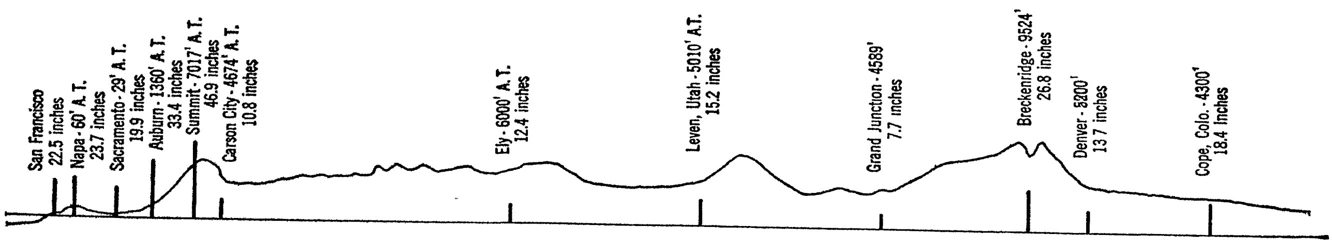


FIG. 193.—Rainfall along an East–West Section from San Francisco to Denver.
The heavier rainfall of the Pacific Slope is well shown. The Rocky Mountain region is an oasis in the arid West.

the geography of the West no doubt is the strong contrast in temperature conditions between the mountain section of the interior and the Pacific Slope.

Temperature Regions.—As a result of the dominance of plateaus and mountains, surface temperature regions extend into much lower latitudes than in the eastern United States. The **Cold Winter and Mild Summer** type of temperature has its greatest areal development in Canada and in the West, even as far south as northern New Mexico in the Rocky Mountain highlands. It also occurs in the Sierra Nevada and in eastern Colorado. A ninety-day (or less) frostless season—generally considered the growing season—covers a large area. Only a small part of this mountain plateau section has more than 150 days free from frost each year. Mountains and plateaus, therefore, bring Canadian lowland temperatures far south into the United States.

The West, from the highest mountains to the lowest basins, has all the temperature regions recognized, except the truly tropical, i.e., the **Always Hot.** All types except this one occur in California, the only state that is so distinguished.

PLANT GEOGRAPHY

Factors Affecting Plant Life.—The elements of the physical environment affecting the distribution and characteristics of plant life are many. Among the more important are mineral composition and physical condition (depth, porosity, size of particles, humus content, topographic position) of the soil, the amount of rainfall and its seasonal distribution, the length of droughts, the humidity of the air, winds, temperature of air and ground, length of growing day, length of growing season, and amount of sunlight. With so many factors involved, the correlation of plant life and physical conditions is a difficult task and one in which errors are likely to arise, particularly where attempts are made at simplification. Yet from the standpoint of the teacher, some simplification seems essential. When large areas and slight differences in plant life are thought of, soil, temperature, and rainfall, as stated in Chapter II, may be taken as the chief elements of the climatic environment. In fact, nearly all of the factors stated above are variants or resultants of these three. In the brief discussion that follows, in which an attempt is made to indicate possible correlations between plant types and physical conditions, these three are the elements considered in the physical environment. (Fig. 194.)

A study of the characteristics and distribution of the native plant life of the West is primarily a question of available soil moisture and

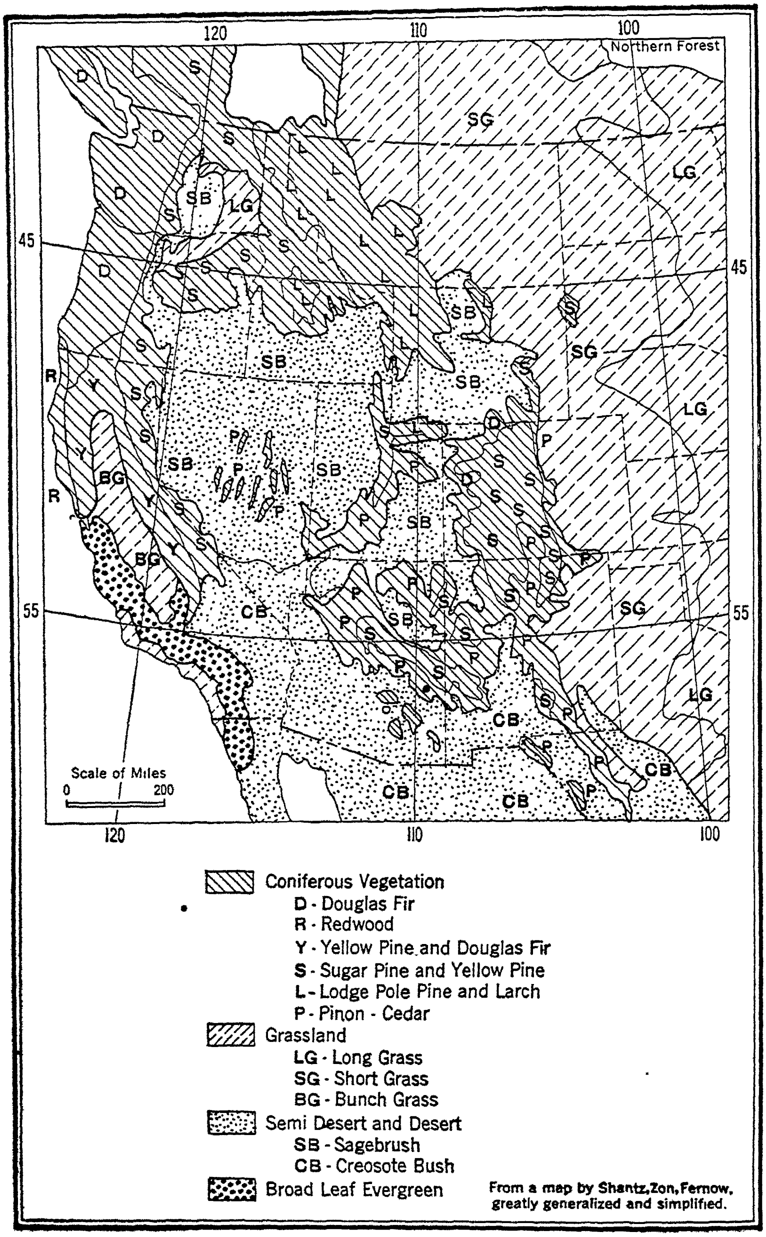


FIG. 194.—Plant Regions of the West.

water demands. The physical conditions of the soil greatly affect the available supply of soil water. The rainfall is never great enough to saturate the soils to great depths; the subsoil in most of the arid region is permanently dry. After a rain, water penetrates the ground, in heavy soils, not more than 6 or 8 inches, in light soils, a foot or two. The depth of penetration is also affected by the amount of rain and other factors. From this upper layer, the roots take up the water and the plant gives it to the air by transpiration. Some is lost by evaporation from the soil. In heavier soils the growth of vegetation may be rapid, but the supply of moisture is quickly used up and the plants early begin to show the effects of drought. On the light soils, since penetration is deeper and there is little movement of water upward or laterally, the plants must send their roots to the soil water. The plant life on light soils is not so luxuriant as in fine or heavy soils, but the growing season is longer because there is a greater supply of water. Fortunately for plant life, light soils predominate in the West. The sink-in is relatively greater than in humid lands, for the soil is porous. The heavy downpours that characterize the rainfall of the arid areas, unfortunately, tend to reduce sink-in, the surface water running off into mud or alkali flats or into streams, with the result that it is largely lost to plant life.

The water demands of the plants vary greatly, being correlated more closely with evaporation rate than with other climatic elements. As a general rule, plants in the southern part of the arid lands require about twice as much water as in the north. It has been found that 518 tons of water are needed to produce one ton of dry alfalfa at Williston, N. Dak., but 1005 tons are required at Dalhart, Tex.[2] This difference is due primarily to the greater amount of transpiration into the hot, dry air of the south. In many parts of the Great Basin, where rainfall is 10 inches or less, the annual evaporation from a free surface is roughly 100 inches. In most of the Basin and Range Provinces, precipitation is only about 20 per cent of the evaporation from a free surface, measured in inches.

Types of the Conifers.—In the humid and sub-humid parts of the West, coniferous forests predominate. Broad-leaved hardwood forests, like those in humid eastern United States or humid northeastern Europe, where climatic conditions are essentially like those of the Pacific Northwest, are wanting. Some plant geographers have suggested that the absence of broad-leaved deciduous trees is a question of dispersal, mountain barriers and aridity preventing migration from the East, the nearest center from which dispersal could take place. The question, however, is an unsettled one. Climatic conditions may not account for the absence

[2] Briggs and Shantz, Second Pan-American Scientific Congress, Washington, 1915–16.

of deciduous trees, but there seems to be a definite correlation, in a rough way at least, of size of tree and density of stand to amount of rainfall, and of species to climate, soil, and moisture. Six types of coniferous forests are recognized in the West. Figure 194 shows the distribution of the several types. The pinon-juniper plant formation, also coniferous, is a woodland. It grows on the desert edge of the coniferous forests.

Sclerophyll Vegetation.—The broad-leaved evergreen, or broad-leaved sclerophyll, chiefly of California south of San Francisco Bay, is a plant type that has its development in areas that are semi-humid, with winter rain and summer drought, and that have moderate winter temperatures. The drought comes in the growing season when the temperatures are high and the air dry. The plants, therefore, to survive, must possess, if left to natural environmental control, drought-resisting devices. The local name for this formation is *chaparral*, but the formation is readily correlated with the well-known Mediterranean type, being characterized by trees with leathery, strongly cutinized, evergreen leaves, thick bark, short, knotty trunks, gnarly branches, and a large root development. Bulbous or tuberous biennials are numerous, and there are some succulent plants like the cactus.

Western Grasslands.—The grasslands of the West occur in areas of moderate aridity, the greatest area being found in the Great Plains region. Within this grassland area there are great differences in the amount of available moisture and soil composition, the more favorable sections being found in the northern and eastern areas. On the eastern edge of the Great Plains, the grass is luxuriant and forms a fairly dense sward. To the west it is shorter and tends to grow in bunches; and in the south, in Texas and New Mexico, it grades off into desert grasses, weeds, and scrubby growths. Sagebrush is common in the drier portions of the Great Plains in Montana and Wyoming. The grass of the Valley of California and the coast lands of southern California is of the bunch-grass type, luxuriant in the spring after the cool winter rains, but during summer and fall brown and dead, yet furnishing fairly nutritious food for grazing animals.

Desert Vegetation Types.—There are three main types of desert and semi-desert vegetation in the Western States: a northern or semi-desert sagebrush type, mainly on the Intermontane Plateaus between 37° and 44° N. latitude; a southern or creosote brush type in desert areas south of 37°, and mainly in the area that has 10 inches or less of rain a year; and a third type where the mantle rock is composed of shifting sands or is highly alkaline. (Fig. 195.) This latter is not a climatic but largely an edaphic desert, the result probably of geologic or topographic conditions. Succulent plants are more charac-

teristic of this edaphic desert than of the climatic. Salinas or salt plains have a fourth type known as greasewood. This type occupies but a small area in the West. The annuals, or rather wet-season plants, of the desert have few of the above characteristics. They are mesophytic in structure and physiology. They germinate after a rain, if temperature conditions are favorable, and grow as long as there is a supply of moisture; as the supply decreases, they blossom, produce seeds, and die as the supply is exhausted. The seeds lie dormant in the desert sands until the next wet spell, which may occur in a few days, months, or even years. It is the annuals that change the barren desert landscape into flowery meadows, ephemeral at the most.

Photo by Parkins.

FIG. 195.—A Desert Landscape near Mojave, California.

Lands of this sort have little promise for irrigation even though water were available. Shifting sands cover most of the flat lands.

LAND UTILIZATION

The humid coniferous forest regions, those of the Pacific Northwest and the Northern Rockies, where topographic conditions permit, are suitable for humid agriculture. Dry farming is possible in most of the Great Plains grasslands and the grasslands of California, the yellow sugar pine areas, and the chaparral. Some of the sagebrush lands are dry-farmed, although agricultural operations are often precarious. Failure is certain in the creosote-brush area. Irrigation is possible in any of the areas if water is available; but in the creosote-brush area the soil, if strongly alkaline, needs to be freed of alkali by repeated washings. Most of the edaphic, salt, and alkali deserts are probably impossible of

reclamation. Grazing is possible on all the non-agricultural lands, but the carrying power of the ranges varies greatly. Their capacity is influenced largely by the relative amount of rainfall and evaporation. (See discussion on grazing.) (Fig. 200.)

DISTRIBUTION OF POPULATION

The Population of the Future.—The type of ultimate land utilization (see also Chapter I) is an index of the future population that may be supported. Close settlement is possible in the humid areas, where topographic conditions permit, and on irrigated lands; both dry-land farming and grazing make for scattered and few people. The humid area of the West is roughly only about 7 per cent of the total area, and only a small part of this has slopes low enough for cultivation. Careful calculations show that not more than 5 per cent of the arid land west of the 20-inch isohyet can be irrigated, even when all available water is utilized, unless economies in the use of water not now practiced are discovered. Probably, therefore, not more than 10 per cent of the entire area of the Western States can ultimately have well peopled settlements. There is no way of determining or estimating the future density of population that may exist on this 10 per cent of area, for commerce, manufacturing, and mining set no limits to population density; but 90 per cent of the total area is destined to remain a region (or regions) of scattered houses with densities but little greater than at present.

Factors in Population Distribution.—To-day the Western States, although 20 per cent larger in area than the North and 34 per cent larger than the South, have only one-fourth the population of the latter section and one-seventh that of the former. Aridity is not the sole factor that limits the number of people, for the West is younger than the East, but it is certainly the chief factor. The people, in general, may be found largely on the humid lowlands of the Pacific Northwest, on the irrigated lands, and in the mining sections.

QUESTIONS, EXERCISES, AND PROBLEMS

1. Construct a structure section similar to Fig. 192 along a line through San Diego, Tucson, and El Paso. Secure data from Weather Bureau bulletins or from the Statistical Abstract.

2. Draw a structure section across the Pacific Slope and indicate thereon the temperature regions. Explain the location of each region.

3. Make a detailed study of the rainfall and temperature types of California in relation to surface features. Write your findings, giving explanations.

4. What correlation do you make between vegetation and climate in California?

5. Make a careful study of the relation of distribution of population and water supply for agriculture in the West.

6. What are the climatic and physiographic reasons for the general lack of navigable rivers and the dominance of railroads in transportation?

7. Why was it that the National Government had to encourage western railroad building by grants of land?

8. Why is it that reds, browns, and yellows are the dominant colors in the landscapes of the West?

9. What climatic conditions make the resort and recreational business of Colorado, New Mexico, Arizona, and southern California profitable? Write to the chambers of commerce of cities in these regions for literature on this business.

10. The securing of an adequate supply of pure water is a difficult problem for every city that attains any great size. In the humid portions of our country, the large cities have spent tens of millions of dollars each to provide suitable supplies of water. In the arid and semi-arid portions of our country the problem is still more difficult of solution. Make a careful study of the ways in which San Francisco and Los Angeles have solved the problem. Emphasize, first of all, the adverse physical conditions they had to overcome, the opportunities nature offers, and how these opportunities were utilized.

CHAPTER XVIII

AGRICULTURE IN THE WEST

Types of Agriculture in the West.—There are three types of agriculture practiced in the West, namely, humid agriculture in the Pacific Northwest; dry-land farming, most successful in the Great Plains and in the northern half of the Rocky Mountain area and the Intermontane Plateaus area; and, irrigation, widely distributed in all the states and physiographic regions except in the humid area. (Fig. 196.)

In humid farming and dry-land farming, man uses the moisture as nature distributes it. In the former, particularly in Washington and parts of Oregon, the water is generally so plentiful that man gives little heed to its conservation; but in the latter, precipitation is so slight that he is forced to use every device that experience and science have taught him to conserve it in order that he may have enough to supply the crops. In irrigation, man is not satisfied with nature's distribution. He collects the water from a large area, or utilizes nature's devices for collecting it, and distributes it over a small area. All three types require rain; and hence the amount and distribution of the rainfall of the West, discussed in the previous chapter, is as much a determining factor in the amount of crops that may be raised and the distribution of these crops as it is in humid America; and even more so, for the total amount of water is nearer the minimum requirement in the West than in the North and South. The third type of farming will be discussed first.

IRRIGATION

The West is still so new that possibly not a half or a third of the irrigable area is now irrigated. Many hundreds, if not thousands, of acres that are now dry-farmed will be supplied with water in more copious amounts by man; and many thousands of acres of worthless desert land, now growing sagebrush or creosote brush, will yield crops as valuable as the best lands in humid America. In 1920 less than 2 per cent of the arid and semi-arid portion of the West (Pacific, Plateau, and

Mountain States and a part of the Great Plains) was irrigated, or about 18,400,000 acres.[1] (Fig. 196.)

The Beginning of Irrigation.—The methods and practices used in the irrigated areas of the West are largely America's own. In a crude way, irrigation has been practiced for centuries in all the ancient countries: Egypt, Assyria, Babylonia, Persia, India, China, Greece, and Italy. In our arid Southwest, the Spaniards in the sixteenth century found the more progressive Indians with canals and ditches for distributing the water over their patches of corn. Americans have probably received little or no knowledge of irrigation practices from any of these sources.

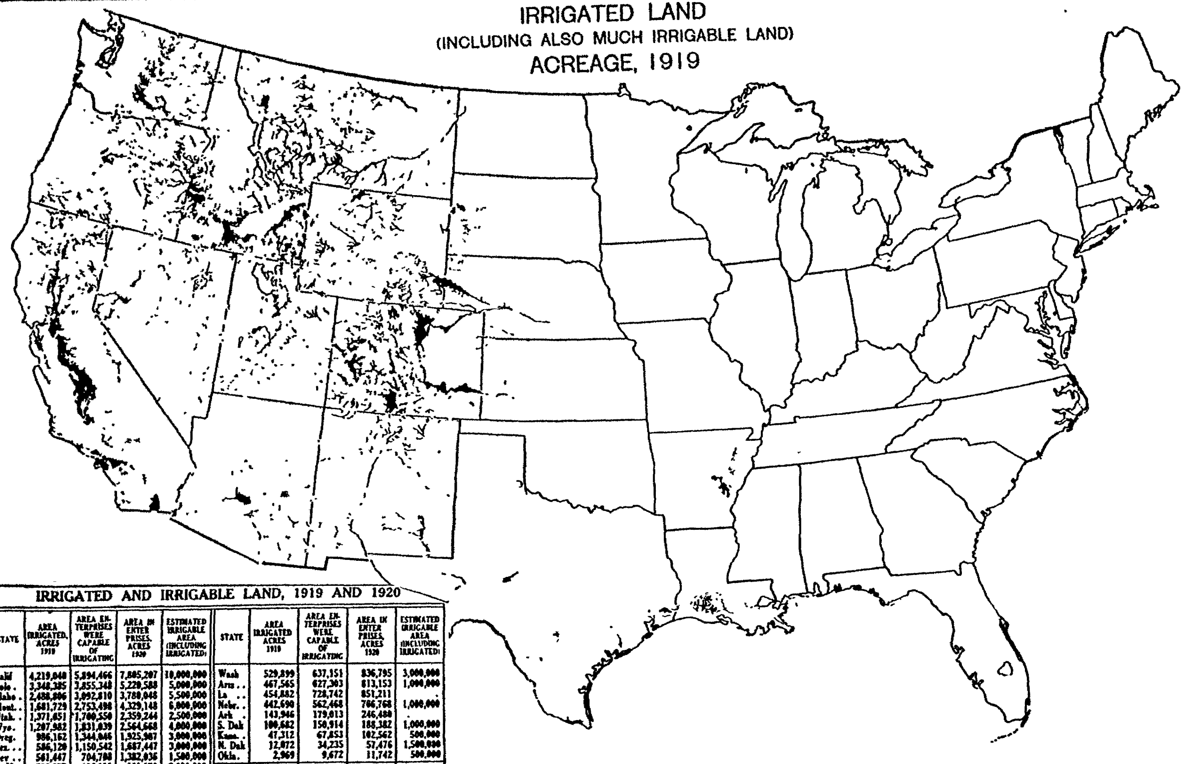
At first the devices used in the West to get water on the land were very simple. The Mormons, near Great Salt Lake, were the first whites in English-America to attempt irrigation. In 1847 or 1848 they diverted the water from small streams of the alluvial fans on the western slope of the Wasatch Mountains. Only simple dams were needed. Nearly all the early irrigation in the West was as simple as this. Experience gave confidence, and larger projects were undertaken and completed successfully. The large costly projects undertaken by the Reclamation Service of the United States find their equal from an engineering standpoint in the works of the British engineers in Egypt and India.[2]

Source of Water for Irrigation.—The source of water for irrigation is varied. Water for about 85 per cent of the area irrigated is from streams,

[1] The data in Vol. VII of Fourteenth Census cover all the states that have irrigated lands, thus including Arkansas and Louisiana, as well as eastern Texas. The total irrigated area of the United States is 19,192,000 acres (in 1919). This is about 1.6 per cent of the total area of the states in which irrigation is practiced. Very conservative estimates, as earlier stated, give about 5 per cent or 50,000,000–60,000,000 acres, as the possible portion of the arid and semi-arid West that may be irrigated using present methods of applying the water and of tillage. This undoubtedly may be materially increased by a more careful distribution of the water and by construction of storage reservoirs where not now provided.

[2] The Reclamation Service has irrigated only a small part of the West, as the data below indicate. In 1919 the irrigated area in the United States, 19,192,000 acres, was distributed, as to methods of development, as follows:

Individual and partnership	6,849,000 acres, or	35.7 per cent of total
Coöperative	6,581,000 acres, or	34.3 per cent of total
Irrigated District	1,823,000 acres, or	9.5 per cent of total
Commercial	1,822,000 acres, or	9.5 per cent of total
U. S. Reclamation Service	1,255,000 acres, or	6.5 per cent of total
Carey Act	524,000 acres, or	2.7 per cent of total
U. S. Indian Service	285,000 acres, or	1.5 per cent of total
City	40,000 acres	
State	5,600 acres	
Others	7,000 acres	



IRRIGATED AND IRRIGABLE LAND, 1919 AND 1920

STATE	AREA IRRIGATED, ACRES 1919	AREA ENTERPRISES WERE CAPABLE OF IRRIGATING	AREA IN ENTERPRISES, ACRES 1920	ESTIMATED IRRIGABLE AREA (INCLUDING IRRIGATED)	STATE	AREA IRRIGATED ACRES 1919	AREA ENTERPRISES WERE CAPABLE OF IRRIGATING	AREA IN ENTERPRISES, ACRES 1920	ESTIMATED IRRIGABLE AREA (INCLUDING IRRIGATED)
Calif	4,219,040	5,894,466	7,885,207	10,000,000	Wash	529,899	637,151	836,795	3,000,000
Colo.	3,348,385	3,855,348	5,220,588	5,000,000	Ariz. .	467,565	627,303	813,153	1,000,000
Idaho .	2,488,806	3,092,810	3,780,048	5,500,000	La. . .	454,882	728,742	851,211	.
Mont. .	1,681,729	2,753,498	4,329,148	6,000,000	Nebr. .	442,690	562,468	766,768	1,000,000
Utah .	1,371,651	1,700,550	2,359,244	2,500,000	Ark .	143,946	179,013	246,480	.
Wyo.	1,207,982	1,831,039	2,564,668	4,000,000	S. Dak	100,682	150,914	188,382	1,000,000
Oreg.	986,162	1,344,046	1,925,987	3,000,000	Kans. .	47,312	67,853	102,562	500,000
Tex. . .	586,120	1,150,542	1,687,447	3,000,000	N. Dak	32,072	34,235	57,476	1,500,000
Nev. . .	561,447	704,708	1,382,036	1,500,000	Okla.	2,969	9,672	11,742	500,000
N. Mex	538,377	696,119	961,879	2,000,000	U. S. .	19,191,716	26,020,477	35,890,821	51,000,000

From Census Report, Vol. VII, 1919.

FIG. 196.

and for 76 per cent of the land is distributed by gravity flow from streams.

These data are for all the irrigated land of the United States. About 14 per cent of the irrigated land is supplied by pumping from streams, lakes, or wells. The stream is thus by far the most important source of water. In some of the simpler enterprises, from the engineer's viewpoint, a small dam of stone, cement, logs, or dirt is constructed across the stream to divert the water into canals that lead away from the pond or lake thus made above the dam. In some places no dam is necessary, but the diversion dam is the common engineer's device, whether a few acres or a hundred thousand are to be supplied with water.

Extent of Engineering Works.—Although irrigation in the West is still in its infancy, the amount of work that has been done to develop the enterprises now in operation, when taken in the aggregate, is tremendous. The main ditches measure more than 100,000 miles, and the lateral ditches 58,000. More than 7500 reservoirs have been provided, besides 29,500 pumping plants. The total capital invested amounts to nearly $700,000,000.

Water a Factor in Distribution.—The distribution of the irrigated areas is very irregular over the West and bears a definite relation to the supply of water. In general, it may be said that most of the irrigated areas are in the valleys of the rivers that take their rise in the great mountain areas. Nearly all the irrigated lands of Washington derive their water from the rivers that flow down the east slope of the Cascade Mountains. There are few valleys in Oregon on the east slope that may be irrigated, those of the Hood and Deschutes rivers being the exception. (Fig. 197.) The Columbia, one of the great rivers of North America, with its large flow, is little used; but the Snake River, its largest tributary, is one of the most important streams of the West in irrigation. Both the Sacramento and the San Joaquin get most of their water from the Sierra Nevada. Little use has been made of the rainfall of the Coast Range for irrigation purposes, for in Washington, Oregon, and northern California agriculture is possible without the artificial application of water. South of San Francisco Bay, all the way to Mexico, the rain is torrential in its fall. Only a few reservoirs have been constructed.

The Rocky Mountain region is by far the chief source of the water used in irrigation in the West. The Snake, the Green, the Bear, the many short streams of the Wasatch, the Grand, and the Gunnison, and others tributary of the Colorado, all have their sources on the western slope of the Rockies. The Snake River and its tributaries alone irrigate 2,713,000 acres. On the eastern slope of the Rockies are many important rivers. In Montana, the main stream of the Missouri, and a

vegetables. Forage crops take up a large acreage, alfalfa being the great favorite among them because of its heavy yield, three or four cuttings per year being common returns. About 45 per cent of the alfalfa crop of the United States is grown under irrigation. Dairy cattle, pigs, and poultry are common in most of the irrigated regions. On most of the irrigation projects from central California, Utah, and Colorado northward, there are large orchards of apples, pears, peaches, cherries, and plums, and the acreage being put in each year is increasing. About 30 per cent of the apple crop of the country in 1919 was grown in the West. Strawberries and bush fruits are also common.

The chief apple-growing centers in Washington are around Lake Chelan, the Yakima Valley, and the Wenatchee Valley. The Hood River region, the Willamette Valley, and the Rogue Valley in the Klamath Mountains are important sections in Oregon; while Boise is a center in Idaho, Grand Junction in Colorado, and the Missoula Valley in Montana. Apple growing in the Northwest is a science; nowhere in the United States is more attention paid to orcharding. Spraying, pruning, and smudging to protect from untimely frosts, picking, sorting, and marketing receive the utmost attention. The fruit growers here are not entirely free from losses, although losses are much less than in other parts of the country. In a climate as dry as this, there are few insect pests; and the isolation of the irrigated regions, one from another, tends to check the spread of any pests. The growers, however, take great precautions against their spread. Spraying is done at all times of the year, and there are exacting state laws that prohibit the importation of infected and infested fruit trees. All nursery stock is carefully inspected and put in quarantine, and violators of these regulations are severely prosecuted. Some of the most valuable agricultural land in our country is in the apple district of the Northwest. Orchard lands sell for $500 to $1500 or more per acre.

In the Southwest the longer growing season, the hot summers, and the general absence of frost permit the farmer to raise "warm-climate" crops. Wheat, oats, and rye are grown, but on irrigated land these crops are declining rapidly in the face of increasing attention to fruit growing, truck gardening, and other intensive types of agriculture. As in the Southern States, many of the crops raised in the northern portions of the West may be grown in California, Arizona, and New Mexico, and in addition many that are strictly sub-tropical and even tropical.

About a third of the total value of California crops is that of fruit and nuts, and these are largely produced on irrigated lands.[3] In the

[3] In 1919 the percentage of production on irrigated lands in California, for selected crops, was as follows: lemons, 88; oranges, 87; olives, 70; grapes, 55;

northern section of California, apples, plums, peaches, prunes, and cherries are the hardy fruits grown on the slopes and valley floors, mainly north of 37°. Most of the grape vineyards are south of 39°. The raisin grape is grown mainly in the southern portion of the San Joaquin Valley, Fresno, Calif., being the chief center for shipping.[4]

Truck gardens are numerous about the larger cities, and asparagus and tomatoes are raised for canning. (Fig. 75.)

Although oranges and olives are grown north of the latitude of San Francisco, where the soil is well drained and the air drainage is good, most of the citrus fruits are in the San Joaquin Valley and southward. The largest area of orange groves is found in the Los Angeles region. From southern California also comes most of the domestic supply of lemons. Although olives are also found in the Valley of California, only recently has there been much interest in their production. Almonds and walnuts have about the same range as the orange.

Florida was the first state to grow oranges for American markets. The refrigerator car, reasonable railroad rates, and the work of the coöperative association have all aided in giving the California orange a large place in eastern markets. California now produces about 65–68 per cent of the oranges of the country, and practically all the lemons. Florida holds first rank in pomeloes and limes. While California is freer from frosts than Florida, mainly because of the protecting mountain walls that tend to check the sudden southward sweep of cold spells, frosts may occur from December to February, even in the Los Angeles region, and smudge pots or other devices are prepared for these months. A hard freeze in 1913 did great damage to trees, especially to those growing in low places. California is much freer from fungus diseases than is Florida, yet the fruit grower must be on his guard. There must be constant spraying to keep off mites, the red spider, the scale insect, and other pests.

So much is said and written about western fruit growing, and the Western coöperative associations advertise so freely that it may be well to consider a summary of the fruit industry of the West in comparison with that of the country at large. This summary is shown in Table XIII.

The Lack of Markets and How Overcome.—The greatest drawback to western farming is the lack of markets or the long distance to markets. The coastal states, where the largest cities are located, have better mar-

walnuts, 51; almonds, 20; peaches, 64; apricots, 44; sugar beets, 63; apples, 27; plums, 50; cherries, 50. (Census Report, Vol. VII, 1920.)

[4] For a very excellent discussion of raisin growing in California, see "The California Raisin Industry," by C. C. Colby, Annals of Association of American Geographers, Vol. XIV, June, 1924.

kets than Utah, Idaho, Arizona, and New Mexico. The great market for any of the money crops is the densely settled portion of our country.[5]

TABLE XIII

A SUMMARY OF FRUIT PRODUCTION IN THE WEST IN 1919

Fruit Crops in 1919	Value of	Percentage of Product of U. S.
Apple	$77,000,000	34, in bushels
Grape	67,000,000	80, in pounds
Orange	67,000,000	60, in boxes
Peach	38,000,000	40, in bushels
Plum—prune	36,000,000	88, in bushels
Lemon	19,000,000	99, in boxes
Apricot	12,000,000	99, in bushels
Pear	12,000,000	49, in bushels
Cherry	6,000,000	40, in bushels
Fig	2,000,000	
Small fruits	11,000,000	17, in quarts

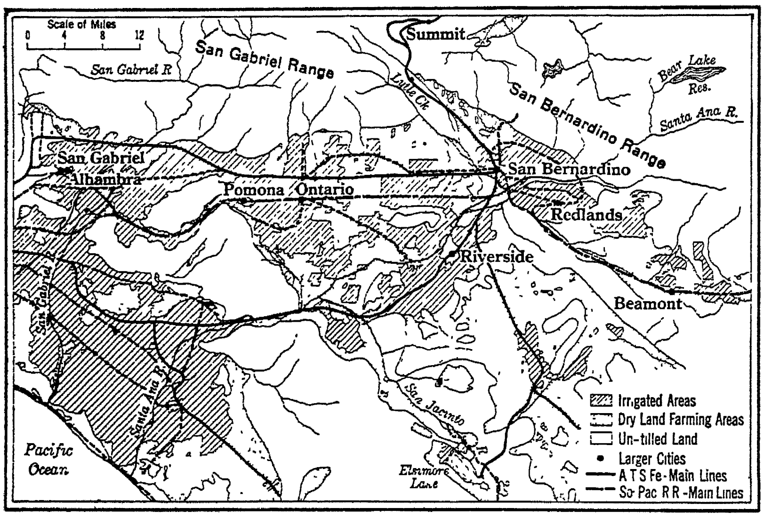
For several years, coöperative associations and exchanges in the West have striven to develop the markets of the Eastern States for some of their products. They have succeeded in giving the public a reliable product of uniform grade, tastefully and carefully packed. The work of these agencies is diverse in nature. They secure capital and credit, adapt production to market demands, establish grades and standards for the products, provide cold-storage facilities, select brands and trade marks, advertise, develop old and extend new markets, secure favorable freight rates, utilize by-products, eliminate waste, and purchase supplies. The perishable nature of the products they handle, the great distance to market, the strong competition offered by areas nearer the great markets of the country, and the small land units controlled by the individual producer have brought the associations into existence. The marvelous success of western fruit in capturing and holding eastern markets is due largely to the admirable work of these coöperative associations. The large returns and the stability of the market have brought prosperity and satisfaction to the producers.

A Type Area in Irrigation in Southern California: The San Bernardino Valley.—The San Bernardino Valley in southern California, some

[5] In railroad rates the coastal district has an advantage over interior sections on some commodities, the rate for goods between New York and San Francisco being lower than between Salt Lake City and New York.

30 or 40 miles east of Los Angeles, is undoubtedly one of the best-known and most prosperous irrigated areas of the Southwest. Here at Riverside were planted the first two Washington navel orange trees in southern California, and to-day citrus fruits are the chief money crops of the prosperous farmers. The developments in this area are wholly individual, partnership, coöperative, or company enterprises. (Fig. 198.)

The Physiographic Development of the Valley.—The San Bernardino Valley, some 40 miles long and 4 or 5 miles wide, is structural in origin. Stretching like a huge wall along the north border of the valley is the eastern portion of the San Gabriel Range, and on the eastern border



Part of Irrigation Map of Southern California.

FIG. 198.—Irrigation and Dry Farming in the Santa Ana Valley Region.

Some of the untilled land is grazed for several days to a few weeks after rains. Since most of the rain comes in the winter, winter grazing on the untilled land is the rule. The mountain ranges are United States Forests, with scrubby growths at lower levels and scattered pines above.

the San Bernardino Mountains. Cajon Pass, at the gap between the two ranges, is the only gateway to the north and northeast. Along the southern border is a range of low hills and rough, stony plateau land; and the western border is a low, almost imperceptible ridge which separates the valley from the plain that borders the Pacific. The valley is, therefore, a basin, the only outlet for surface water being the Santa Ana River, which flows southwestward to the Pacific across the low western barrier of the valley. Into this basin, streams from the bordering mountains and hills have carried huge amounts of rock débris, filling it in some parts to the depth of several hundred feet. Since the higher

mountains are on the northern and eastern border, on which the heaviest rain falls, these have furnished much of the filling material of the basin. Deposition is thus greatest in the northern and eastern portion, and here alluvial fans have their greatest extent. In fact, the fans that stretch out from the base of the San Gabriel and San Bernardino mountains cover more than three-fourths of the surface of the basin. The Santa Ana River, as a result of the encroachment of the fans, lies near the southern border of the valley. The fans are, as a rule, steepest near the apex. The outer borders are nearly a dead-level plain. The scattered hills that rise abruptly above the valley plain are partly buried portions of the original structural valley surface. The filling material from which the soil is derived varies in size from boulders weighing many hundreds of pounds to silt and even clay. During and after heavy rains the transporting power of the water that rushes down the mountain canyons is great, and huge masses of rock are moved down the slope. Only the finer material is carried far out on the fans. The coarser mantle rock and soils, therefore, are found about the borders of the valley; the finer material, near the Santa Ana River.

The channels of the intermittent streams are very indefinite and during flood time become choked, the water often scouring out new channels or spreading over wide areas. In these stream channels only coarse gravel and boulders are left; the finer material is carried away by the rapidly moving water. Each year, large additions of rock débris are made to fans, often on pastures and even cultivated lands. The National Government, in order to check erosion as much as possible, has set aside the forest lands on the higher mountain slopes as forest reserves.

The Valley a Natural Reservoir.—The valley is also a huge natural reservoir for collecting the rain that falls on the valley plain and the surrounding hills and storing it away in the loose gravel, sand, and silt. Clay makes up only a small part of the filling. The many streams that descend the slopes of the bordering mountains and hills are really tributaries to the Santa Ana, but in most seasons do not carry the water to the master stream in surface channels. The waters sink into the rock filling of the natural reservoir. The only surface outlet is the Santa Ana, and that carries water only during the wet season. To reduce the run-off in any part of the valley, the streams are often diverted and forced to spread over the surface and thus increase the sink-in. At some places tunnels have been dug into the gravel, into which water is directed. Much water, no doubt, escapes from the basin along the "thalweg" of the Santa Ana.

The scarcity of perennial surface streams, in the San Bernardino

Valley, from which water may be obtained in great volume forces the irrigators to do much pumping. In 1919 there were 360 flowing wells and 1816 other wells from which water was pumped from the huge underground reservoir. Formerly the number of flowing wells was much larger, but the excessive use of water has so lowered the water table that pumping is necessary in many wells that once flowed freely. It is only along the eastern, and particularly the southern, border of the valley that canals are used for distributing the water, and these for the most part carry it to the lands on the slopes of the valley. Some of these canals take their rise in the canyons of the bordering mountains or uplands. The Gage Canal, the largest and most important, gets its water chiefly from the Santa Ana River to the south of San Bernardino, where a ridge of bed rock, running transverse to the general slope of the valley, ponds back surface and sub-surface waters, and forms a swampy area, the water table thus being near the surface. The irrigated area of the San Bernardino Valley (or the basin of the Santa Ana River) is nearly 186,000 acres. It is estimated that the works in operation in 1920 were capable of supplying water to 219,000 acres. The supply of water in most years is so little in excess of the present demand for irrigation that there is great need of water conservation, and in few other places in the West is water handled so carefully. Practically all the open canals and conduits, whether in porous gravels or fine soils, are cement lined. In the orchards, water is distributed through an expensive system of underground pipes.

Climatic Conditions.—The rain comes mostly during the winter months, about 90 per cent from October 1 to May 1, and at the most is limited in amount. The average precipitation at Riverside is less than 11 inches, at San Bernardino about 16 inches. This is barely sufficient for dry farming, particularly because of the high evaporation rate and the great thickness of the porous soils. It is from the high mountains on the north and east and the uplands to the south that most of the water used in irrigation comes. On the non-irrigated areas the amount of rainfall and the porosity of the soil determine the distribution of the various crops. During the hot summers, the monthly maximum of April, May, June, July, August, and September being from 100° to 113°, evaporation is rapid, so that many of the methods employed in moisture conservation in dry-land farming are practiced even on irrigated lands.

The valley is somewhat protected from cold plateau winds by the mountain walls in the north and west. The winds that descend into the valley are moderated by adiabatic warming. At San Bernardino the frost-free season is, on the average, from March 14 to November 18. But

San Bernardino is in the path of air drainage down through the Cajon Pass from the Mohave plateau, besides having an altitude of more than 1000 feet. At Riverside, 560 feet lower, the frosts that occur come between December 16 and February 15. The January average in the valley is rarely below 51°. The mean minimum at Riverside is 21°, coming in December or January. Some winters may be very mild and practically free from frost. Tomato vines are known to live for years in the open in protected places. The "northers," however, that come down through Cajon Pass at critical periods of the year do much damage. In the summer time they are energizing, but are often unwelcome to the valley dwellers, particularly during the raisin-drying season. Many vineyards are not irrigated, and, since the light soil of the vineyards blows easily, the "northers" often produce heavy dust "storms." Desert winds, called Santa Anas, are dry, hot, and oppressive. When strong they also give origin to dust storms and sand drifts.

The Distribution of the Crops.—Slope, which favors air drainage during the frost-threatening season, is a determining factor in the distribution of the citrus fruits. It also determines the number of smudge pots necessary and the frequency of their use. Soil also is a factor in the distribution of the orchards and crops. Orange and lemon groves are found chiefly on the lower slopes of the mountains and hills and on most parts of the alluvial fans where the soil is fine. Probably 80 per cent of the groves are on loams. A few are on silty clay-loam soils. The demands of the lemon tree are more exacting than those of the orange. Since the season for production is longer than for the orange, care must be taken to locate the orchards where the air drainage will be even more perfect than in orange groves. Lemons demand not only good air drainage but also good soil drainage, so that aëration of the roots is active.

The Crops of the Valley.—Both oranges and lemons are irrigated from five to eight times during the season, depending on the amount of soil water, the time of occurrence of the spring and fall rains, the total amount of rain, and the rate of evaporation. Water is run into the furrows until it has penetrated about four feet. The annual cost for irrigation is \$2.50–\$20 per acre. It takes about 4 years for an orange grove to grow to the bearing stage, and about 12 to 18 to reach maximum production. Orange groves yield about 150–160 boxes per acre on the average each year, and lemon groves 180–210 boxes. In spite of the high freight charges for refrigerator cars to the distant markets in the northern, central, and eastern United States, the groves return fair profits. The coöperative associations aid materially in insuring fair returns by their admirable marketing methods.

Grapefruit trees are increasing in number, but the market for the fruit is chiefly local. Olives have long been grown in a small way for local consumption, but in late years southern California has invaded eastern markets with this fruit. Olive trees border many citrus-fruit orchards, and several large olive orchards have been planted in the last decade or two. It was once thought that irrigation was unnecessary for olives, but it has been found that the application of water gives greater returns and a better quality of fruit. Air drainage is not necessary as with citrus fruits.

Among the more important deciduous fruits are peaches, apricots, and grapes. Most of these fruits are grown without irrigation unless the soil on which they are planted drains rapidly. Canneries, which market their products in all parts of the United States, use a large part of the peaches, apricots, and pears. Apricots are also dried. Grape culture is most active on the coarser-textured soils, which permit aëration and the deep penetration of the root systems. Some varieties are irrigated, particularly the Muscat, but most of them are merely dry-farmed and can thus be grown where water is not readily secured by ditches. There are dry-land vineyards on the upper portions of the fans that border the San Gabriel Range. Some varieties of grapes are used in the making of grape juice (formerly there were several wineries), the seedless and Muscat varieties are table grapes; but most of the output of the vineyards is dried and sold as raisins in all parts of the country.

Walnuts, pears, apples, figs, plums, and a few other tree crops occupy less attention than the fruits discussed above. These as a rule are not irrigated. Wheat and barley, for grain, are also grown without artificial application of water; but vegetables and small fruits, as well as sugar beets, even on the lower lands near the Santa Ana River, are irrigated to get profitable yields. Alfalfa, which, with green wheat and barley, supplies the fodder demands of the dairy herds of the valley, is generally given but one "wetting" a season. Alfalfa is adapted to land that may be irrigated easily yet is not suitable for citrus fruits because of lack of slope, lack of aëration, or too much moisture. The long root system enables plants, even on knolls which are not easily irrigated, to get their quota of water. The long growing season enables the farmer, if the proper amount of water has been supplied, to obtain from five to eight cuttings each year.

Stages in the Development of Irrigation.—The farmers of the valley to-day are largely native Americans, many of whom have settled there because of the attractive environment and the mildness of the winters. Many came well provided with money. They have taken up small plots of ground and have built comfortable homes. The climate permits the

planting of a great variety of ornamental trees and shrubs, and these, with the surrounding orchards of orange, lemon, olive, walnut, and other trees, make the homes exceedingly attractive.

The Franciscan *padres* founded the San Gabriel Mission in the San Gabriel Valley, to the west of the San Bernardino, in 1771. Here the local Indians were enlisted, mainly by compulsion, to irrigate the lands on which were raised grains, vegetables, olives, grapes, and figs to supply the needs of the mission.

Photo by Parkins.

Fig. 199.—An Irrigation Canal on the Southern Border of the San Bernardino Valley.

This canal carries water to the mesa at Riverside. The water in the canal in the immediate foreground is siphoned under the road to the open canal on the slopes of the valley in the left background.

The first Americans to settle in the valley, at San Bernardino, were Mormons from the irrigated areas about Salt Lake City. They obtained a tract of land in 1851 from the Mexican owners and began general farming and grape culture, water being secured from the Santa Ana River and from artesian wells. The settlement, however, was abandoned in 1857.

The greatest agricultural activity in the valley dates from 1870, at which time the Southern California Colony Association purchased several thousand acres of an old Mexican grant, called the Jurupa Rancho, and the Riverside Colony was founded. The land was laid off into 10-acre tracts. The irrigated areas heretofore had been only on the low lands bordering the Santa Ana, but the association, at an expense of $50,000, constructed a very serviceable canal from the Santa Ana River, carrying it by means of flumes across canyons and by tunnels through hills to supply water to the mesa lands about Riverside. (Fig. 199.) Raisin grapes were the first fruits raised and, until the refrigerator

car came into general use, were about the only money crop that reached eastern markets. From trial plantings in the San Gabriel Valley it was known that the climate was suitable for the growing of oranges. This industry in the San Bernardino Valley dates from 1873, when the first two navel orange trees, as earlier stated, were planted at Riverside. Only one is now alive (1923). A tablet on the iron fence that encloses the remaining tree bears this statement: "One of two trees from which all Washington Navel Oranges in California have descended. Propagated by shoots from a tree imported from Bahia, Brazil, in 1870, by the United States Department of Agriculture. Sent to Riverside, California, in 1873."

A company took over the association's rights in 1875 and spent $200,000 in expanding the canal system.

The growing of oranges on the mesa in and about Riverside was a bold venture at first, but it was soon discovered that the mesa land, where air drainage was good, was better adapted for citrus orchards than the gentle slopes of the alluvial fans. The new company, therefore, began the excavation of a much larger canal, the Gage Canal, which was completed in 1887. This carried water from the Santa Ana to lands much higher on the mesa than those reached by the old canal. Most of the new irrigated area was set out to navel oranges. By this time both the Southern Pacific and Santa Fé railroads had been constructed through the Valley—the Southern Pacific in 1870 and the Santa Fé in 1885—and direct, though distant, contact was established with the East. This wide market greatly stimulated the industry, and many new tracts of land were taken up and improved. From 1902 to 1919 the capital invested in irrigation in the Santa Ana Valley increased from $2,000,000 to $20,000,000. The region has about reached its maximum development in area under irrigation, owing to the limited supply of water.

DRY-LAND FARMING

Dry-land farming, as defined by one of the great authorities, is "The profitable production of useful crops, without irrigation, on lands that receive annually a rainfall of 20 inches or less." Dry-land farming is really farming under drier conditions than exist in humid sections, and it is probably best not to introduce the question of amount of rainfall. Even where the rainfall is 30 inches or more, some farmers increase their yield by careful tillage, and it seems possible that the soil response to careful tillage here is similar to that in semi-arid areas. It is impossible

to state the area of the West that is dry-farmed for no census data have been collected on this type of farming.

Problems of the Dry-land Farmer.—In humid lands the farmer endeavors to maintain soil fertility by keeping the soil in good physical condition, by maintaining the required amount of essential chemical elements in the soil, and by providing a suitable amount of humus. Only in a minor way does he think of water conservation, and although the adaptation of varieties of crops to soil moisture is essential for the most profitable farming, the fact that little attention has been given to this adjustment shows that it is not essential to success. In the arid lands the problems confronting the farmer are far greater, for besides the maintenance of soil fertility he has the problem of water conservation, the most critical of all, and also the selection of crops that will grow best with the limited amount of water available. Successful dry-land farming calls for careful, painstaking, intelligent husbandry.

Experiments at the various agricultural experiment stations in the dry-land farming area have demonstrated that a rainfall of 10 inches, if all is saved, will furnish enough water to give yields of wheat and other crops, far above the average of the country.[6] Fortunately for the farmer, nature has provided a natural storage reservoir in the soils of the arid land. They contain little clay, as a rule, are porous, granular and, therefore, permeable and deep. Soil and subsoil are practically alike. The water table (if there is one) is so far from the surface that the rain water rarely percolates far enough to reach it. The water that falls as rain forms a sheet of gravitational water in the upper interstices of soil and subsoil and gradually works its way down, becoming capillary water. By becoming capillary water its downward journey is checked, and if the soil is properly worked a large amount of this capillary water remains within reach of the roots of the plant. This is soon used up if the soil is heavily cropped; frequently a sufficient amount of water may be stored to give fairly good yields of "drought-resisting" plants.

The problem of the farmer is so to work his land that all or nearly all the water that falls will soak into the ground and be retained there for the production of crops only. He accordingly plows deeply and works the land continuously when not in crop. He keeps the upper surface well pulverized to expose as little surface for evaporation as possible.

[6] At a Utah experiment station, experiments have shown that it takes 45 tons of water to produce one bushel of wheat. A rainfall of 10 inches per year is equivalent to 1130 tons of water per acre. If all this could be directed into the wheat plants, without loss in run-off, evaporation, or seepage, it would supply the water required for 25 bushels of wheat. If half the rain water were lost, 10 inches of rain would grow 12½ bushels, and 20 inches would grow 25 bushels.

The land is harrowed after every rain to break up the hard crust that often forms, and to produce a dry mulch. As soon as one crop is off, plowing and harrowing begins for the next. Fallowing is always necessary where the rainfall is much below 20 inches. In many sections crops are grown only every other year, or the fallowing may extend over two years. It has been found that 20 inches or more of rain may easily be stored in the upper horizons of soil and thus be reached by the roots of the plants. Weeds should not be permitted to grow, for they absorb as much moisture as commercial plants.

The Problem of Plant Selection.—Plant selection is another problem. As a result of many trials and failures in the breeding of new varieties, and by the importation of plants from the semi-arid regions of Europe and Asia, this problem is being solved. Barley, rye, and some varieties of wheat have long been recognized as adapted to dry, porous soils. Corn, although the cool nights check its growth, does fairly well, particularly in the southern portions of the West. Many of the grain sorghums are widely used, as Kafir corn, durra, and milo maize. Alfalfa is raised for its seed.

Many of the crops now grown in the arid lands are centuries old. Civilization developed in irrigated river valleys and the semi-arid deserts of Asia and Africa, and many of the crops we raise to-day were cultivated by man even in the primitive stages of his development. It is from the Old World semi-arid areas that we have introduced, in the last few decades, plants admirably suited to our arid land. Many agricultural practices in these Old World lands, although primitive and traditional to a high degree, are yet successful and must be considered as dry-land farming methods. The Indians of northern Mexico and our Southwest, long before the coming of the Spaniards, raised corn and must perforce have used some of the methods now employed by the white man. Certain phases of dry-land farming have long been practiced on the chalk downs of England and France, in many parts of the Mediterranean, and in southern Russia.

The First Dry-land Farmers.—Dry-land farming in English–America dates from about 1850, when some Mormons, through sheer desperation, because of failure to get water for irrigation, cleared a small area of sage-brush land and secured fair returns from the wheat sown. There are no definite records of these early experiments or of the methods used; but it is believed that many Mormons tilled the dry lands on the Wasatch Piedmont by methods they had worked out and found successful as early as 1854 or 1855. Moisture-conserving methods were used in the Sacramento Valley as early as 1861; in the Bear River Valley, Utah, by 1863; on Sand Ridge between Salt Lake City and Ogden, about 1865;

and in eastern Washington in the Palouse region and in the Cache valley, Utah by 1870.

In the early eighties many farmers were attracted to the Great Plains of Kansas and Nebraska by cheap land and immense yields of wheat. They used humid-land seed and methods in a region that had long been considered as a part of the Great American Desert. The idea was advanced that rain—in increasing amount—followed the plow. All that was needed, therefore, to make the Great American Desert a productive farming region was to turn over the sod. The great profits made for the first few years attracted farmers from all over the Northern States and some from the South. These ventures happened to have been made during a period of rainfall heavier than the normal, and when the annual precipitation went back to the normal there were failures on every hand. Farms, villages, and towns were abandoned, although a few farmers remained. Some of the farmers went into stock raising; others modified their methods of tillage and were able to live on, yet with greatly reduced standards of living. They were the first of the dry-land farmers of the Great Plains.

Dry-land Farming in Franklin County, Washington.—Although Franklin County in southeastern Washington is considered by physiographers as forming a part of one province, the Great Plains of the Columbia River, its surface presents two strongly contrasted types of topography: a gently undulating plain in the west, a high rolling plateau in the east. The latter is the western extension of the well-known "Palouse County" of southeastern Washington and the nearby portion of Idaho, famous for its wheat production. The soils are largely residual, yet loessal in origin, having been derived from lavas and coarse-grained igneous rocks that everywhere underlie and in some places project through the mantle rock, and later worked over by the wind. The loessal material is deposited largely in the form of sheets 50–100 feet thick. Stream erosion during the moist Glacial Period and, to a limited extent, later stream and wind erosion have modified the surface. The soils are fairly uniform in mineral composition and, in a broad way, quite uniform in texture. The subsoil is light brown, fine, and compact, and has a tendency to form crumbs when worked. Soil and subsoil absorb rain water readily, except in sudden heavy downpours. The fine texture favors the retention of water near enough to the surface to be within reach of the roots of the crops. It is thus naturally a dry-land farming soil. It is remarkably uniform in texture and composition to 6 feet or more in depth and over wide areas. This uniformity in areal extent is a condition of great importance where the question of

adaptation of farming practices to soil is a critical one, as it is in dry-land farming.

The rainfall of Franklin County varies from 7 to 22 inches. It is in the portion of heavier rainfall that dry-land farming is most successful; yet soil texture and topography, which largely determine the retentive power of the soil for moisture, are the most important factors in success or failure.

Wheat is the leading crop of the area, being grown chiefly for seed.

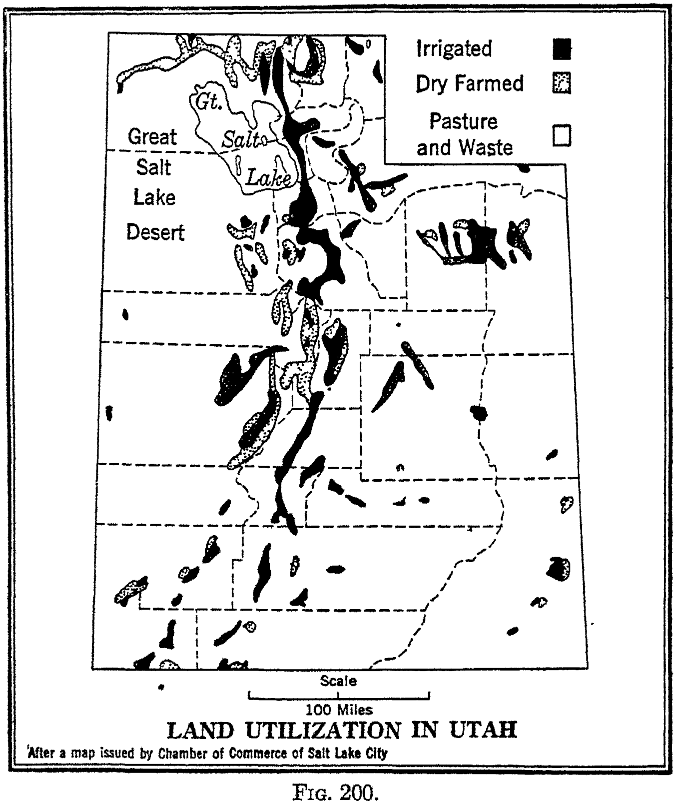


FIG. 200.

The small area of tilled land is striking. Much of the pasture and waste land furnishes green feed for a few weeks after a heavy rain. During most of the year the gray creosote bush and bare ground give the color to the landscape.

Some wheat and rye are cut when green for fodder, for there is not enough moisture for the profitable growing of timothy and alfalfa.

About most of the farmhouses one will find a small vegetable garden and a few fruit trees. Little is done in raising live stock. Horses are used in the farming operations, although tractors are rapidly increasing

in number, and a few cattle, needed to supply the household with milk and butter, are allowed to graze on the unbroken land and in the wheat fields after the harvest season. Both grazing areas supply but a meager amount of food. Before the discovery that the area was well suited for the growing of wheat by dry-land farming methods, grazing was the chief activity.

The indigenous vegetation is bunch grass and sagebrush, bunch grass being dominant on the soils most retentive of moisture. "Clearing" the land is sometimes done by hitching a team of horses or a tractor to each end of a railroad rail and dragging it sidewise back and forth over the surface. The brush is afterwards raked up and burned or kept as fuel. The cost of clearing the land is only about $1 or $2 an acre. The cheapness of the land was undoubtedly the factor that drew people to the region.

Winter wheat takes precedence over the spring variety, the fall sowing being done just after a heavy rain. Preparation of the ground begins in early spring by plowing and harrowing and, during the remainder of the year until fall sowing, the fallow is kept clean of weeds. The precipitation during the growing period of the wheat is not sufficient for the crop, hence all-year fallowing is practiced. Unless the soil forms " crumb " readily, care must be taken not to cultivate too frequently during the fallowing, for " blowing " is likely to occur. Most farmers harrow the land only enough to keep down the weeds. During the fallowing many farmers, to avoid " blowing " of the soil, use weeders that cut the stalks of the weeds beneath the surface without much stirring of the top soil. Disking-in of stubble as soon as a crop is harvested is another practice. Harvesting, over most of the area, is largely done by a " header " leaving a tall stubble, which, when disked into the soil, helps to check blowing, adds a little mineral plant food and, particularly, adds humus. The disked-in stubble also favors sink-in and tends to hold the moisture near the surface. Straw on some farms is often spread over the surface in lieu of dry mulch. This checks blowing and evaporation.

The yield of wheat varies greatly, from a few bushels to as much as 35, the latter in wet years on the better lands. The average is undoubtedly not far from 10 bushels. In years of greater rainfall the yields would be good even without the use of water-conservation methods; in years of low rainfall the crop is almost a failure, no matter how careful the tillage has been. Some farmers pay little attention to dry-land farming practices, believing that careless and cheap tillage in the long run is more economical. They expect to make their living and their profits, if any, during the wetter years. It seems strange to an outsider that farmers should care to remain in a region where farming is such a gamble, when there are large areas of irrigated land, often nearby, that

are unused. There is some abandoned land in this county, an evidence that a few have decided that the dry-land farming game is not worth the trouble. Nearly 7 per cent of the improved land was abandoned between 1910 and 1920.

HUMID-LAND FARMING

The area devoted to humid-land farming in the West, as earlier stated, is very limited, being confined almost entirely to the Puget Sound Trough in Washington and Oregon.

The Physical Environment in the Trough.—The term "trough" no doubt implies in the minds of some readers an area of level lowland between parallel mountain areas. But the surface is anything but level. The central portion of the Trough is chiefly rolling uplands interrupted by hills and broad valleys; and the borders of the Trough are thoroughly dissected foothills or lower slopes of the mountain areas. The area is remarkably well drained, marshes or ponds being found only on the valley flats.

The trough is structural in origin. The northern portion is glaciated. There are deposits, therefore, from the glacier and from the fluvio-glacial waters. Stream action, both before and since the Glacial Period, has produced minor erosion features both in the trough and on the bordering slopes; and the water from the mountain areas has deposited some rock débris. Four types of soils, based on origin, are recognized: residual soil on the uplands, hills, and mountains; soils from deposits by glacial ice and by fluvio-glacial waters, occurring in morainic deposits, kames, outwash plains, and terraces or dissected valley trains; soils of (recent) flood plains; and a few small areas of lacustrine or marsh soils.

The moist climate over the whole area favors the growth of forests; and since the portions first lumbered were along the larger streams, it is in the bottoms and on the terraces that the older settlements and the denser population are found. The great difficulty of clearing the land is no doubt one cause of the slow economic development. The dense stand of timber and the large size of the trees make burning about the only method that may be used to rid the land of stumps and unmerchantable logs after the lumberman has taken his toll, and this makes the cost of clearing \$50–\$150 per acre. (Compare with cost of water rights on irrigated tracts.) Burning also destroys much of the humus of the soil.

The Youth of the Region.—One of the earliest settlements in the Pacific Northwest, a trading post, was made on the Columbia by the

Hudson Bay Fur Company in 1828. In many respects the area under consideration is young. Its agricultural youthfulness is shown in the small amount of land in farms, the small amount of farm land improved, the general lack of attention given crop rotation and its relation to soil fertility, the neglect of most of the orchards, and the general lack of specialization and adaptation of crops to climate and soil. It has been discovered, however, that a few products and types of agriculture give better returns than others.

Land Utilization.—The cool, wet winters (about 50 per cent of the rain comes between November and February) and mild, moderately dry summers, with the ground most of the year well supplied with water, offer admirable conditions for the growing of cool-weather crops. Oats, flax, and hemp are grown on the alluvial bottom lands. The yield of oats is high. Hop growing was once important but has greatly declined, owing chiefly to the uncertainty of securing paying prices for the crop. Potatoes seldom fail to yield abundantly. Nearly all garden vegetables are grown in all parts. The abundant fodder, the long grazing season, the mild winters, and the pure water of the streams favor live stock raising. Dairying is one of the leading types of agriculture in the region. A very large plant for the manufacture of condensed milk is located in Washington, and there are numerous small creameries scattered over all these counties supplying cream and butter to the larger cities of the trough. The breeding of improved live stock is receiving some attention. Most of the dairying and raising of live stock is to be found on the upland areas.

Among the deciduous fruits, prunes have received most attention. The center of prune production in the Puget Sound Trough is in Oregon. Prune orchards are very numerous and much attention is given to their care. The average yield is 4–6 tons per acre. Apples, pears, plums, cherries, and quinces are not grown on a commercial basis and receive far less care. There is an apparent tendency to select rolling land and slopes for the orchards. Every year shows an increasing attempt to adjust the products of the area to improved market conditions. The production of bush fruits is profitable, the climate being particularly adapted to the growing of raspberries, blackberries, loganberries, and strawberries. An evergreen blackberry grows wild and furnishes a valuable crop in the newer sections. The present production of any of these crops is no indication of the potentialities of the region. Although this humid area has been settled many decades, the rate of agricultural development has been slow and is much slower than in the irrigated areas. Economic development here is the result of individual initiative with only a minimum of coöperation of state or national paternalism.

The Markets for the Region.—The trough offers fairly easy grades for railroad building although numerous cuts and fills are necessary, and since it contains all the large urban centers of the Pacific Northwest the farmers everywhere have good railroad transportation facilities to the Trough cities, and from these cities to the other parts of the United States. The bulk of the surplus agricultural products finds a market in the cities of the trough. Condensed milk and dried prunes are the chief farm products that seek distant markets.

(See page 394 for Exercises, Questions, and Problems on the general topic of Agriculture.)

CHAPTER XIX

THE LIVE STOCK INDUSTRY OF THE WEST

CATTLE

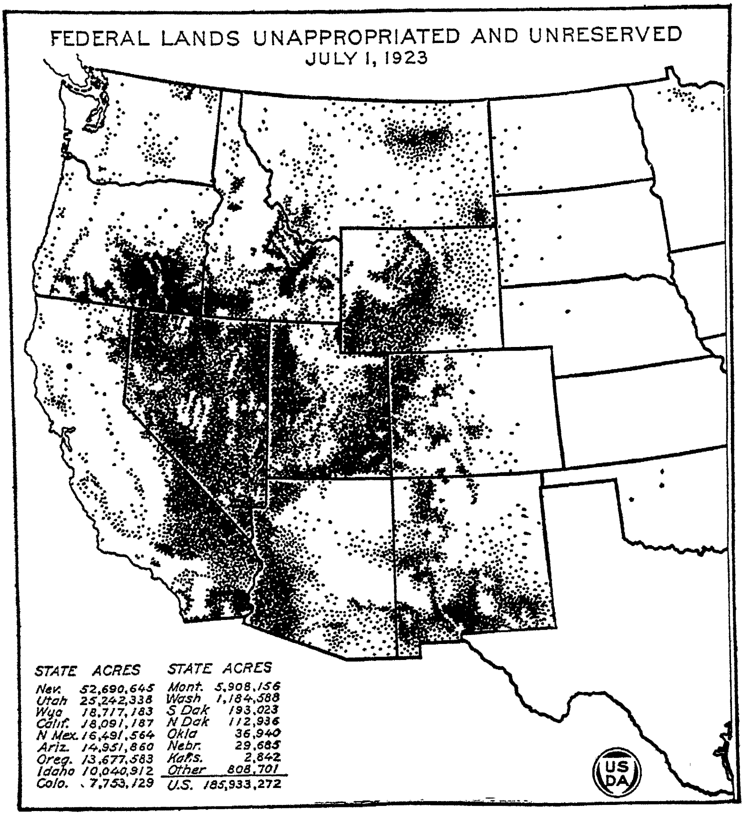
THE cattle industry has always, in the popular mind, loomed big in the economic development of the West, and has furnished themes for scores of novels, short stories, and moving-picture films. The cowboy has long been quite the most important person among western people.

Some Comparisons.—Important as the cattle industry of the Great Plains was reported to be in the 1870's and 1880's, there are far more cattle to-day than at any previous time. Census data show that Kansas in 1870 had only 374,000 head of cattle of all sorts, while in 1920 it possessed 2,975,000; and Nebraska, which in 1870 had 80,000, in 1920 had 2,932,000. In 1880 these two states had 1,535,000 and 1,113,-000 cattle, respectively. Not all of these two states is in the Great Plains, yet the data indicate the tendency in the cattle industry in this region. Montana in 1870 had 37,000; in 1880, 428,000; and in 1920, 1,269,000. Utah in 1870 had 39,000; in 1880, 133,000; and in 1920, 506,000. (Fig. 26.)

Recent Developments.—In the last three or four decades there has been a decided change in the method of conducting the beef cattle industry. Nearly all the open or free ranges in parts of the Great Plains region have been taken up as farm lands, and cattle raising here is carried on largely in combination with farming in which fodder for the winter feeding is a large crop. This is particularly the condition except in the drier western section of the Great Plains. As a rule, not all the acreage of the farm land is tilled. The more level and moist lands are dry-farmed, the rough uplands being left for grazing. These pastures are as a rule fenced, and the number of cattle allowed per square mile is generally adjusted to the carrying power of the range with a view to long-time operations. Losses from winter storms, theft, disease, and predatory animals are much less than in former days.

Grazing Potentialities.—In spite of widespread aridity, the West has great potentialities as a grazing region. The eastern part of the Great Plains, which fed many thousands of " cows " in the early days, is now

mostly under the plow. Even the short-grass regions of the western part of the plains (grama grass in the north, grama and buffalo grass in the central, mesquite grass in the south) are invaded by the dry farmer. There is here, however, much unplowed natural pasturage, but its carrying capacity has been greatly reduced by over-grazing. On large ranches there



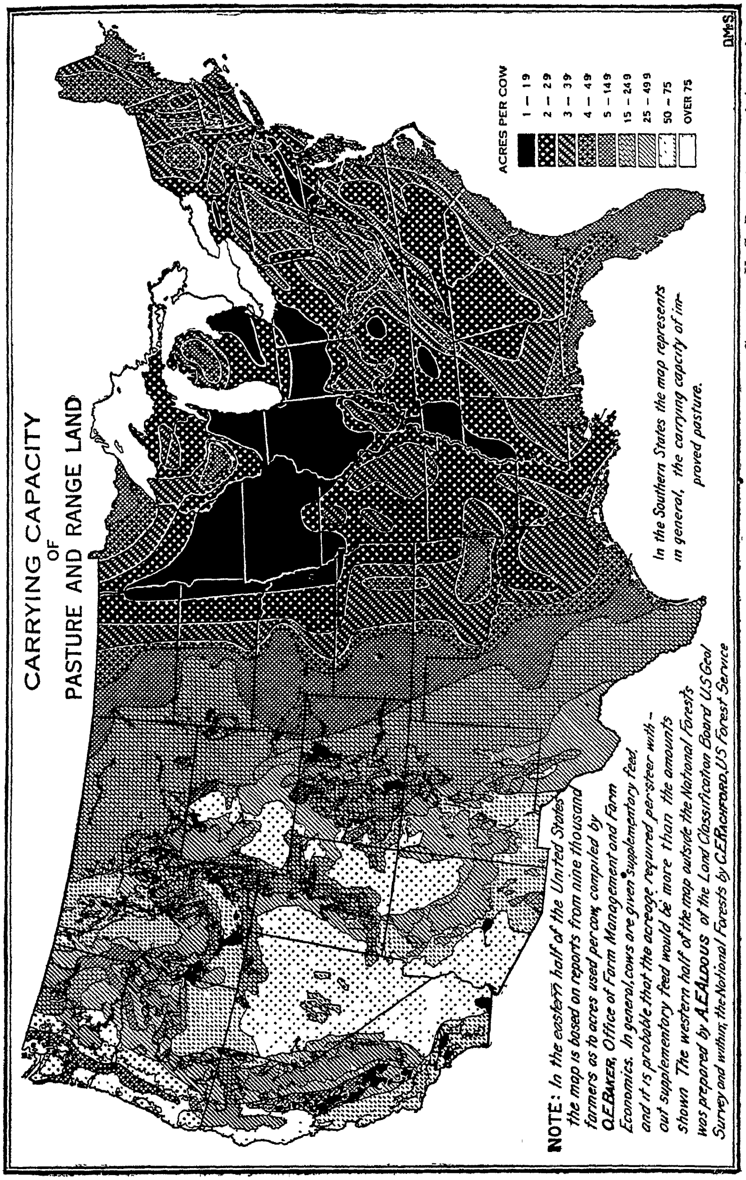
Courtesy U. S. Department of Agriculture.

FIG. 201.

What is the carrying capacity for grazing animals of the unappropriated lands shown in the above map? Is dry land farming possible on the unappropriated lands in any of these states? Is there any probability that these lands will be taken up for irrigation farming? Where?

is enough food for ten to eleven months of continuous feeding. The numerous parks and open spaces in the forests and the alpine woodland of the Rocky, Sierra Nevada, and Cascade mountains are clothed with rich nutritious grasses. But, owing to the long winters, they are snow-covered from six to nine months during the year. They form excellent summer grazing lands. In the Intermontane Plateaus Province there is

only scant pasturage except on the lower parts of the Columbia and Colorado plateaus. The arid lands (sagebrush and creosote) furnish



Courtesy U. S. Department of Agriculture.

FIG. 202.

While the West is considered by most people the great grazing area of our country, this map shows that its lands have a low carrying capacity. Compare with Fig. 26 and draw conclusions as to its real importance in the cattle industry in comparison with other sections of United States.

scant winter pasturage; the higher are used for summer pasturage. (Fig. 203.) As for the extent of grazing lands, there are about 110,000,000 acres in the national forests suitable for summer grazing, for which graz-

ing permits are issued by the Forest Service officers in the respective reservations. In 1920, permits were issued for 2,347,000 cattle. Good grazing lands are also found in the Indian Reservations, mineral land reservations, and state lands. The public domain now measures about 180,000,000 acres, mostly in the Intermontane Plateaus Province and the Southwest, which is open grazing, but the carrying capacity is low

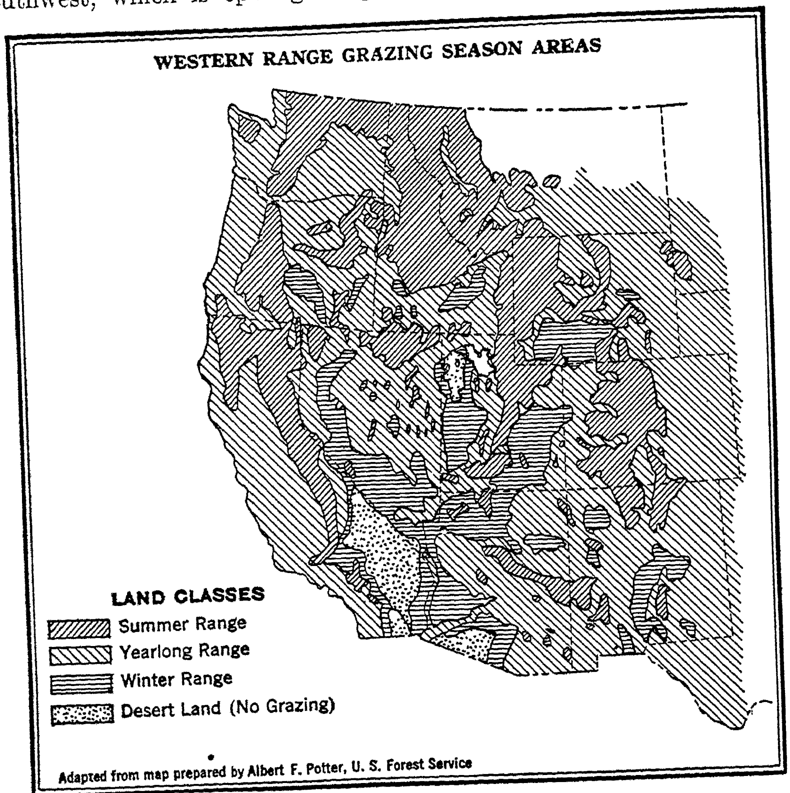


FIG. 203.

The summer grazing lands are largely in the mountains and higher plateaus; the winter ranges in the lower lands.

because of misuse in the past. Besides there are 142,000,000 acres in unimproved land in farms and 146,000,000 acres of privately owned grazing lands not in farms. The total area of semi-arid and arid pasture and range lands in the West is estimated to be more than 500,000,000 acres. (Fig. 201.)

Carrying Capacity of the Ranges.—The carrying capacity of the western ranges varies greatly, as one might expect, depending largely on the climatic factors, rainfall, and evaporation. (Fig. 202.) The length

of the grazing season varies in altitude and latitude, in so far as temperature controls. But the length is also influenced by the seasonal distribution of rain. In those portions having a distinct winter and summer, it is quite the custom to drive the cattle to the higher slopes of the mountains, where the rainfall is greater and evaporation less than on the lowlands, for summer feeding; and to the valleys, where the food of the pastures may be supplemented by fodder, for winter. In the far south, there is some seasonal migration of the " feeders," but winter feeding is unnecessary. (Fig. 203.)

Adjustment of numbers of animals to the carrying capacity of the range is being carried out admirably on the forest reserves. To bring some of the grazing areas to their highest power of production, a system of rotation grazing is practiced.

Dairying in the West.—The dairy herds of the Western States are found almost entirely around the large cities and on the irrigated lands. Nearness to market is one of the factors in the localization of so many of them near the large urban centers of the Pacific Coast. Besides supplying the local markets, the dairies produce milk for condensed or evaporated milk factories, whose product reaches all parts of the country. On the irrigated areas, cattle have a place as consumers of alfalfa, root crops, wheat, barley, and rye fodder; besides, the necessity for intensive use of the land favors dairying. Dairying has brought success and prosperity to many irrigated tracts. (Fig. 72.) The feeds are grown easily. The labor of the farm or ranch is used to a better advantage than would otherwise be possible. The " off season " is reduced to a minimum, for here is continuity of production. The returns are certain. The dairies also furnish the best of fertilizers for the land, which is called upon to produce its maximum. The number of dairy cattle in the beef-producing states is small. The families on many beef cattle ranches purchase condensed milk for family use and buy out-of-state butter or butter substitutes.

Comparison with Other Areas.—Although the total number of cattle, dairy and beef, in the West is less than the number in the North and South, when these numbers are reduced to the basis of cattle per 100 people the West shows up remarkably well. The number of beef cattle in these three sections of the country is 9,000,000, 16,000,000, and 10,000,000, respectively; the dairy cattle, 2,500,000, 20,000,000, and 8,800,000. The number per 100 people is, for beef cattle, 100 in the Western States, 16 in the North, and 50 in the South; and for dairy cows, 28, 32, and 27, respectively.

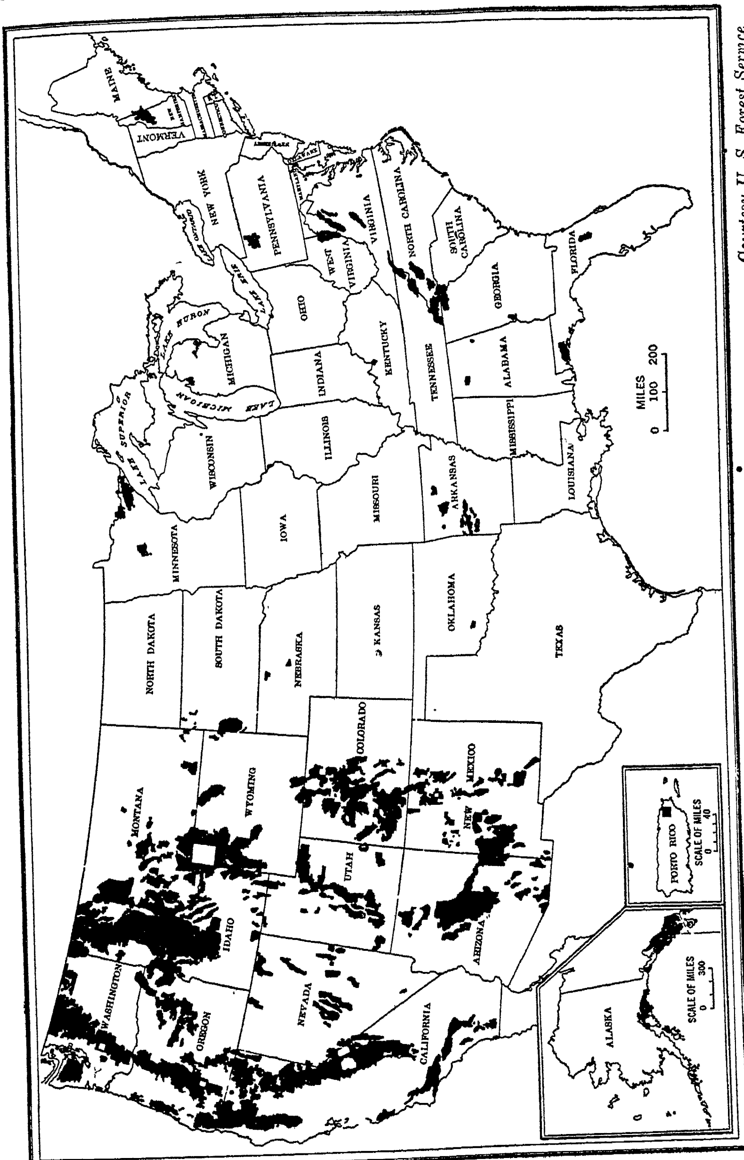
SHEEP

The large area of arid and mountainous lands in the West makes it a natural region for sheep. More than half the sheep of the country is in the eleven Western States. (Fig. 28.) The leading states in recent years (1920–24) were Texas, which leads all others, California, Idaho, Montana, Wyoming, Colorado, Utah, and New Mexico, each having between 2,000,000 and 2,700,000. Sheep in the past were raised in the Western States mainly for their wool, but now the sale of lambs brings in about 55 per cent of the revenue. The ability of sheep to graze close and live on a scanty supply of food and water, and to climb steep slopes, fits them better than cattle for the semi-arid and mountainous areas. Sheep are known to live for days and even weeks without water if succulent food plants are obtainable.

Some Adjustments.—Sheep raising in the West, as in all regions of scanty rainfall, is a pasture-chasing occupation. In the densely populated, humid portion of the United States they are kept in enclosed pasture lands in summer, and in barns or sheds, where they are fed, during the winter. These sheep produce the highest quality of mutton and wool. In the West, sheep raising is on the extensive plan; the flocks are large; the losses great; and the risks so many that the industry is often spoken of as a "game." The large size of the herds and the scanty pasturage force the industry to be, for the most part, a migratory one. In Texas and New Mexico enclosed pastures are common, but in many parts of the West it is only in the winter that the sheep are "at home" on their own lowland pasture lands. Here they graze on nature-cured hay or on green bunch grass that comes up after the fall rains. In inclement weather and when food on the pasture lands is scarce or the surface is covered with snow, they are fed in corrals or housed in sheds. In the spring after the shearing, the sheep are driven, or transported, to leased pasture lands or open ranges on the higher, cooler, and moister plateaus and mountains. In the Rockies, the Cascades, and Sierra Nevada, their summer grazing lands may be above the tree line and even bordering the summer snow line. A large part of the revenue derived from the National Forests is from cattle (previously discussed) and sheep leases. In 1920, grazing permits for 8,300,000 sheep and goats returned to the National Government more than $1,500,000. (Fig. 204.)

Summer grazing requires the services of herders, who keep the flocks in fresh pastures, care for the sick, and protect their charges from predatory animals. One man, with a saddle horse and a dog, will care for 2000–5000 sheep. With an "outfit" consisting of a covered wagon,

bedding, cooking utensils, and other accouterments, the herder follows the flock for months at a time. The herder is visited frequently by a



Courtesy U. S. Forest Service.

FIG. 204.—Forest Reserves of United States.

Their dominance in the West is due to the large area of unappropriated public lands that was turned over to the Forest Service merely by an Act of Congress. Most of the forest reserves in the eastern half of our country have been secured only by purchase.

tender from the home ranch who brings supplies. It is expected, if the year is good, that the wool clip will meet all expenses and perhaps return some profits. During such years the money derived from the sale of

lambs is pure profit, but often, even with this, there is a deficit. The dry-land farmer has now so encroached upon the open ranges in the northern and cooler parts of the semi-arid West that summer pasture lands are about limited to the National Forest reservations and the mountains. The free-range lands, as earlier stated, are so much in demand and so much depleted that most of the operators are forced to purchase tracts or lease from others. With leasing fees to pay or land to purchase, and increased wages in recent years, sheep raising is not so profitable as formerly. Careful management is a prime requisite for success, and more and more expensive equipment is being found necessary. In 1923 there were only 21,000,000 sheep in the eleven Western States, in comparison to 33,000,000 in 1900. Many large operators have gone out of business, but in the past few years the number of small flocks in irrigated areas has increased.

OTHER ANIMALS

Although the raising of swine fits well into the economy of an agricultural region that produces alfalfa and has beet-sugar factories and canning houses, the Western states have few pigs in comparison with the two other sections of the country. There were in 1920 only 2,700,000 in the eleven Western States, to 39,000,000 for the North, and 20,000,000 for the South. California has about a third of the total for the Western states. (Fig. 27.)

Texas, New Mexico, and Arizona are the leading states in the raising of goats, which are much better adapted to the arid lands of these states than sheep. These three states in 1920 had 1,800,000 goats out of the 2,900,000 in the whole country.

QUESTIONS, EXERCISES, AND PROBLEMS

1. What contributions have plant explorers and plant breeders made to agriculture in the West? This task will require much research into literature dealing with crops.

2. What is the Campbell Method of dry-land farming? What adjustments did Campbell make to the semi-arid conditions of the Great Plains?

3. What effect has increasing density of population in the Great Plains had on land utilization there?

4. What is the relationship of the West and Middle West in the beef and the mutton-producing industries?

5. Farming on the irrigated lands in the United States Government projects has not been so successful as anticipated when the projects were developed. Write the Reclamation Service at Washington for the report of the Committee of Special Advisors on Reclamation, Senate Document No. 92, 68th Congress, 1st Session.

Study the findings of this committee to determine the reasons for the lack of success. What are their recommendations for improvement?

6. There has been much discussion about the development of a great irrigation and water-supply project on the lower Colorado River at Boulder Canyon. The matter has occasioned heated debates in Congress between Congressmen from California and Arizona. Several articles have appeared in our magazines, and the Congressional Record contains the debates. Familiarize yourself with the points at issue and decide for yourself the merits of both Arizona's and California's arguments.

7. The Reclamation Service office at Washington, D. C. will supply you with information concerning each of the Government projects of the West. The census volume entitled "Irrigation and Drainage" gives statistics on irrigation. Select one or more irrigation projects and make a study or studies similar to the type discussed in the text.

8. Make a study of the cattle industry of the West. The bibliography in this book supplies references. It also cites sources of information on the sheep industry. Write a paper on each of these industries as carried on in the West, emphasizing the adjustments man had to make to climate, vegetation, density of population, diseases and pests, markets, and competition with other sections.

9. Make a statistical comparison of agriculture in Nevada and Ohio. What explanations can you give for the vast differences?

CHAPTER XX

MANUFACTURING AND MINING IN THE WEST

MANUFACTURING

Comparison with Other Sections of the United States.—The West is new, its greatest growth in population having been made since 1870. In that year these eleven states and territories had only about 1,000,000 people. In 1920 the population was nearly 9,000,000. Although there has been an eight-fold increase in fifty years, there is yet much room for expansion. Not half of the potential irrigable land has been settled on, and certainly large areas of dry land are yet to be developed, while many hundreds of square miles of virgin forest that will some day be removed to give place to agriculture, remain on the lowlands of the humid Pacific Northwest.

In new regions where there are opportunities for settlers to take up cheap land that doubles or trebles in value within a few years, there are, as a rule, few workers who will go into factories and work for the usual wage and the exacting hours of an industrial worker. One should, therefore, expect little manufacturing in the Western States.

In manufacturing, the West is behind the country as a whole, yet there is a surprising development in spite of the youth of the region. The output per capita of the West in 1920 was 77 per cent of the average of the country at large—$590 per capita for the United States, $458 for the Western States. The Western States in 1919 produced 6.5 per cent of the manufactured products of the country (the " value added by manufacture " was 6.3 per cent); while the population was a little more than 8 per cent of the total for the United States.

Some Reasons for Growth of Manufacturing.—One should think of the West as a section in which manufacturing is getting a good start and assuming greater importance every year, particularly in a limited number of types of industries: those producing articles largely for local consumption, and those involved in the preparation of the raw materials for distant markets where secondary manufacturing takes place. There are several reasons for the relative importance that manufacturing assumes in the economic life of the Western States.

The Advantage of Distance from the East.—First of all, it is cheaper for the West to produce many of the manufactured goods that it consumes than to import them, because of the long distance from the industrial centers of the eastern United States and the consequently high freight rates. The long distance from eastern factories is an advantage to the western manufacturer, enabling him to pay higher wages than the eastern manufacturer and yet sell cheaper in western markets. The bulkier the article, the greater the advantage the western manufacturer has.

Water-power Resources of the West.—A second reason for the growth of manufactures is the great supply of water power in the two sections where manufacturing is most important, the Pacific Slope and the Rocky Mountains. There is more power in the streams of the Pacific Coast States than in any other section of equal area in our country. (Fig. 205.)

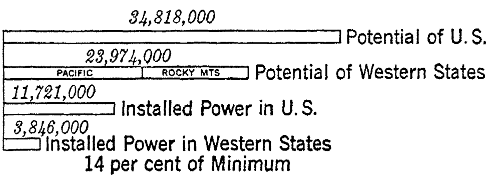


Fig. 205.—Water Power in United States and Western States Compared.

The potential of the Pacific Coast States is estimated to be 13,238,000, or 39 per cent of the total of the United States; and of the Rocky Mountain States, 10,736,000, or 27 per cent, making nearly 70 per cent of the total of the country. In 1927 the installed capacity of water wheels in the West was 3,845,685 H.P., or 32 per cent of that of the country. This was only about 16 per cent of the potential of the West. (Table XIV.)

The water-power plant, like the irrigation enterprise, must look to the mountains for its water, and the water of many streams is made to do the double duty of furnishing power and irrigating land; and in addition may be used on its downward journey to the sea, if it ever reaches the sea, for domestic purposes.

The great fall of the mountain streams is the chief reason for the large amount of potential water power. In Washington, the richest state in the Union in water power, with nearly 5,000,000 minimum potential horse power, an additional factor is the heavy rainfall. Some of the mountain areas have the heaviest rainfall of the country. The same conditions prevail in most of western Oregon, northern California, and the northern part of the Sierra Nevada slope. In many parts of the Cascades and the Sierra Nevada, copious supplies of water are furnished by the melting glaciers on the high mountains.

All the states of the West richly endowed in water power, are, except

California, in northern latitudes. Steep slopes, vast forests, numerous lakes, and a fairly low evaporation rate are all favorable conditions. Flathead Lake, Lake Pend d'Oreille, Lake Cœur-d'Alene, and Lake Chelan are the larger lakes of value in equalizing stream flow. Flathead River, which flows out of Flathead Lake, with the proper amount of storage dams could furnish 500,000 H.P.[1] On the Snake, below Huntington, Ore., between 800,000 and 900,000 H.P. could be developed. About 300,000 H.P. is undeveloped at The Dalles of the Columbia. The Deschutes, in Oregon, has more than 457,000 H.P. These are only a few of the streams of the West that have large potentialities in water power. The Great Basin, except about its borders where streams come down from the mountains, has little available water power. The rivers that rise in the Southern Rocky Mountain area, while not possessing so much power as those of the Northern Rockies, have enough to supply the increasing needs of the people in this part of the West for many decades.

TABLE XIV

POTENTIAL WATER POWER OF THE WESTERN STATES *

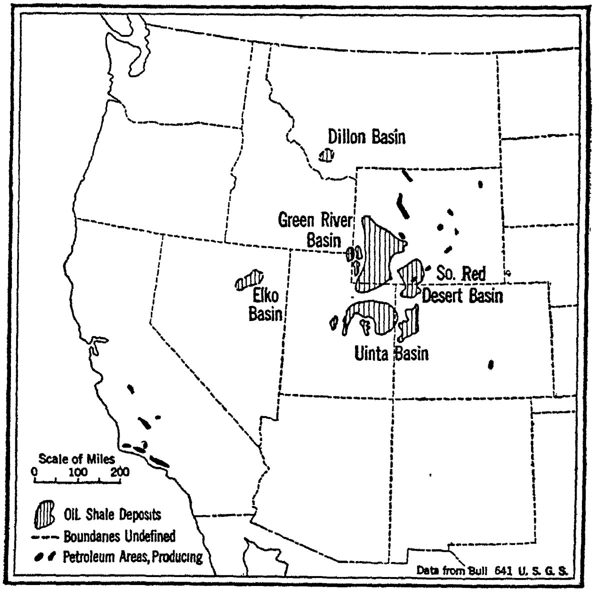
	For 90 Per Cent of Time	For 50 Per Cent of Time	Installed, 1927
Washington	4,970,000	7,871,000	656,722
California	4,603,000	6,674,000	1,916,980
Oregon	3,665,000	6,715,000	241,759
Montana	2,550,000	3,700,000	376,040
Idaho	2,122,000	4,032,000	320,097
Arizona	2,759,000	2,887,000	59,360
Utah	1,420,000	1,586,000	153,435
Colorado	765,000	1,570,000	95,554
Wyoming	704,000	1,182,000	10,480
New Mexico	116,000	186,000	1,808
Nevada	300,000	370,000	13,450
Total West	23,974,000	36,773,000	3,845,685

* Data furnished by U. S. G. S., Jan. 1, 1927.

Coal Reserves.—The large deposits of coal in Colorado, Utah, and Wyoming supplement greatly the meager water-power resources in the middle Rocky Mountain area. (Fig. 35.) The estimated available supply of coal in Colorado is more than 317,000,000,000 tons, under 19,750

[1] Data for individual sites from Atlas Com. Geology, 1920.

square miles of, surface. Wyoming has 670,500,000,000 tons; Utah, 88,000,000,000; New Mexico has 191,800,000,000 tons to offset its scanty water-power resources. Montana is the richest of the Rocky Mountain States in power reserves. In addition to the great amount of water power, it has 381,000,000,000 tons of coal in its available stock. Some of the coal, particularly in Montana, is lignite; yet in the other states it is a good quality of bituminous, and in some parts there is anthracite. (See maps showing the coal-producing areas.) The Pacific slope is poor in coal. Washington, although relatively very active for several decades in coal mining, is estimated to have less than 64,000,000,000 tons in its reserve. Oregon has less than 1,000,000,000, and California is practically without coal.



From Map in Bull. 641, U. S. G. S.

FIG. 206.—Oil Shale and Petroleum Areas.

Within the last few years scores of patents have been taken out for the distillation of oil shales It is claimed by good authority that oil may be extracted at a cost of $1.25 per barrel. There is little probability, however, that the industry can be developed while petroleum is as abundant as now. Synthetic gasoline from coal as a base may also check the development.

The Oil Resources. — The great stock of oil in the Bakersfield and Los Angeles regions is called upon to supply fuel and power to the railroads, factories, and homes in California, and even to ocean ships and railroads extending beyond the limits of this state. California for many years has been one of the leading oil-producing states of our country. (Fig. 168.) From 1917 to 1921 it stood second to Oklahoma, which held first place; it surpassed that state in 1923. California crude oil is not so rich in gasoline and lubricating oils as is the oil of the Appalachian fields. (See map, Fig. 206, for distribution of petroleum fields and oil-shale areas).

Oil Shales.—It is impossible to give the reserve of petroleum, and much less that of the oil shales of Colorado, Wyoming, Utah, Nevada.

Montana, and elsewhere. One estimate gives 20,000,000,000 barrels as the possible reserve in the oil shales of Colorado alone. Up to the present the reserve of oil shales has not been levied on, because of the high cost of extraction. A plant at Elko, Nev., constructed in 1924, is believed to be a commercial success but this remains to be seen. The first distillation of oil shales in the West was undertaken by the Mormons near Juab, Utah, where their old retorts are still to be seen. Small-scale operations and crude methods were not successful in competition with the cheap petroleum of the East. Early in 1927 the Navy Department announced that engineers had succeeded in developing an economical method for utilizing oil shale. For many years oil shales have been utilized successfully in the production of petroleum in Scotland. Not every plant erected or every method tried has been successful, but a few have been, and what is being done in Scotland can be done in America. The threatened shortage of petroleum and the profits that will accrue to any company developing a commercially successful method of distillation of oil shales are stimulating many investigations. There is nothing of the boom element in oil-shale development. This utilization will be purely a manufacturing activity requiring large plants and large capital.

The West has power, therefore, far in excess of its needs for a long time to come. Water-power development in most parts is awaiting public demand. The total coal production in 1920 amounted to about 40,000,000 tons (U. S. 540,000,000). Much of this is used on the railroads.

Raw Products for Manufacturing.—The Western States have great quantities of a few raw products that must undergo some manufacture in preparation for market, which is largely in the Eastern States. Foremost among these primary manufactures are those producing forest products, canned fruit and vegetables, fish, flour, and sugar, and the precious, semi-precious, and more useful metals.

The Commercial Forests of the West.—The distribution of the forests in the West has been noted. In 1919 the Western States furnished more than 29.3 per cent of the lumber cut of the United States. Washington produced more than half; and Washington, Oregon, and California, about 90 per cent of the Western production. (Fig. 207.)

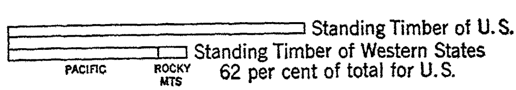


FIG. 207.—Forest Reserves of the United States and the West Compared.

Because of the economic youth of the West and the great distance from the large timber markets, the slaughter of the forests has been

much less than in the eastern part of the country. In the West as a whole there are still standing 77,400,000 acres of virgin forests out of the original 140,800,000, or 1,360,000,000,000 board feet out of the original 1,800,000,000,000. The Pacific Coast area has 52 per cent of the standing timber of the United States, and the Rocky Mountain states 10 per cent.

The Lumber Industry in the Northwest.—Although the first commercial sawmill in Oregon was constructed in 1844, and the first on Puget Sound in 1845, the lumber industry in the Pacific Northwest was of little importance until after the discovery of gold in California. Fifty or more years before this date, timber had been cut at various places along the coast for the construction of ships engaged in the Pacific trade, but it was not until the "gold rush" brought thousands of people to the semi-arid regions in the lower Sacramento and at San Francisco that there was a demand for the timber of the coast lands of Washington, Oregon, and northern California. A market was also developed in the Hawaiian Islands. Many New Englanders, some from the lumber region of Maine, came in ships around the Horn with complete logging and sawmill equipment and began the slaughter of the forest, the lumber being sent by vessel to the San Francisco Bay ports.

For thirty or forty years after this, the development of settlements in the Northwest was slow and the demands for lumber were limited. Besides, home builders of the Prairie States and the Great Plains looked to the sawmills of the Great Lakes and Upper Mississippi for lumber; but with the decline of lumbering in the Middle West and the building of railroads eastward from Portland and the Puget Sound cities, a greatly expanded market was opened up, and the Pacific Northwest began its rise as a lumber region, the most rapid rise being since the early eighties. By 1885 there were 228 mills in operation in these two states. By 1910 this region had surpassed the Great Lakes States and the Northeastern States in amount of output. (Fig. 180.)

The largest and best-equipped mills in the world to-day are to be found in the Pacific Coast lumber towns. This is due primarily to past experiences in the lumber industry and abundant capital from the East. When the industry first started, Oregon was most active because it was first settled, but accessibility to the forests bordering the long shore-line of Puget Sound soon gave Washington the lead.

The Pacific Northwest does not cut so much lumber as the Southern States, but Washington is the leading state of the Union in output of the sawmills. The market for Pacific lumber now covers the entire United States, except parts of Maine and some of the Southern States; besides Australia, China, Japan, and the west coast of South

America, Mexico, and Central America. Some lumber is shipped to South Africa. The railroads extending eastward from the Pacific Northwest have aided the industry greatly by granting low freight rates. Uniformity of species, large size of tree, and great density of stand, as well as large-scale enterprise, enable the manufacturers to produce lumber at a lower cost than in most parts of the South.

The Importance of Douglas Fir.—The principal timber species of the Pacific Coast are the Douglas fir, cedar, spruce, red fir, yellow fir, and Oregon pine. About 20 per cent of the lumber cut in the United States, in board feet, is Douglas fir. It is claimed that the existing stand of this species is about 27 per cent of the standing timber of the United States, including both hardwood and softwood, and that there are 554,000,000,000 feet of Douglas fir west of the Cascades. It is the dominant forest tree in the Pacific Northwest, making up, in some tracts which have been examined carefully, 92 per cent of the stand. It is difficult for one to visualize the tremendous amount of timber on an acre unless one has traveled through these forests. Trees 4–6 feet in diameter stand so close together that in the midst of a large stand one can see but a few feet in any direction, and a cart could not be driven through the forest even were the underbrush cut. Some stands of smaller timber are so thick that it is doubtful if a pack animal could traverse them readily. Like most conifers, the Douglas fir is remarkably free from large limbs and knots, and produces a strong, durable lumber of medium weight, adapted for all structural purposes. The average stand is 35,000–40,000 board feet, and some acres scale 150,000 feet. Some of the larger trees 10–12 feet in diameter and 250 or more feet long, yield 10,000–15,000 feet. As previously stated, uniformity of species, large size and density of stand are the factors that favor the production of lumber in the Pacific Northwest. (Fig. 208.)

Another much-advertised species of the Northwest is the redwood, confined to a small area in northwestern California, mainly north of San Francisco Bay, and southwestern Oregon. (Fig. 209.)

The large size of the timber, the great density of the stand, the lack of snow and ice, the relatively small volume of water in the mountain streams, and the roughness of the topography of much of the forested areas all offered new problems for the lumbermen to solve. New methods of logging, transportation, and manufacture, vastly different from those in the East, had to be devised.

The sawmills of the Rockies and the Colorado Plateau are not so large or efficient as those of the Pacific Northwest. Logging is easier, but the timber is small and scattered, and the waste in lumbering and manufacturing relatively greater than with the "big" trees. (Fig. 210.)

Canning, Preserving, and Drying Industry.—The long distance from the great markets of the country and the "off season" demand for fruits and vegetables are the chief reasons for the prominence of the Western States in the canning and drying of fruits and vegetables. The total value of canned and preserved fruit and vegetables amounted to almost $229,000,000 in 1919, and the value added by manufacture to $72,000,000. Only five Western States are active in this industry, yet they produce more than half the output of the whole country. The total for the United States in 1919 was only $402,000,000 for the value of the products and $136,000,000 for the value added by manufacture. California stands far above all other states, producing nearly $190,000,000 worth. The canneries of California using both fruit and vegetables are not only the most numerous of those of any of the states but are by far the most active. They produce nearly seven times as much, by value, as do the canneries of Maryland, the second state in rank. Apricots, peaches, and pears are the chief fruits canned in California, and berries in Washington and Oregon.

Photo by Parkins.

FIG. 208.—Lumber Camps of the St. Paul Lumber Company near Tamaco, Washington.

Douglas fir and cedar are the principal species cut. The logs reach the mills at Tacoma by railroad.

Within the last few years the Pacific Coast States have been preparing juices for eastern markets. One fruit little known in the East until its introduction as a fruit juice is the loganberry, a hybrid of a raspberry and a blackberry, discovered by Judge James H. Logan in his

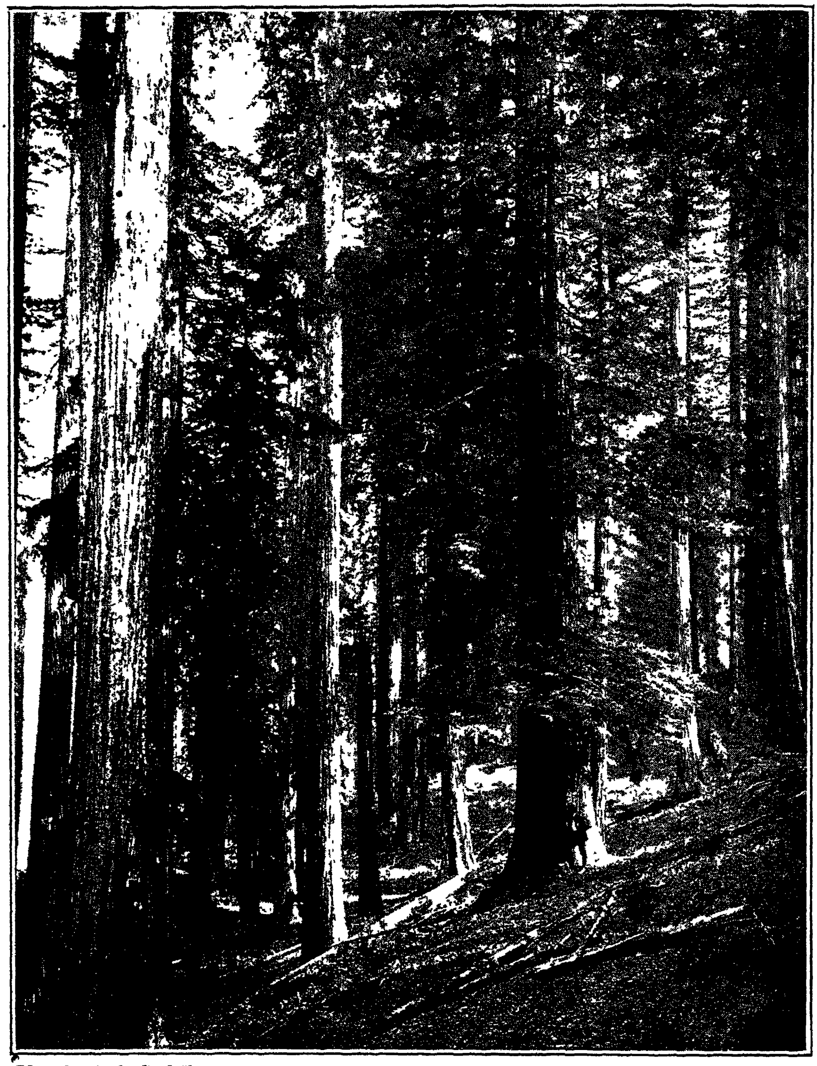


Photo by A. S. Gaskill. *Courtesy of Forest Service.*

FIG. 209.—A Redwood Forest in Northwestern California.

The redwood (*Sequoia sempervirens*) has a very restricted range. It is rarely found above 3,500 feet altitude, and generally grows in deep valleys or on coastal plains within 25 miles of the ocean. It produces more timber per square mile than any other tree in the world, except the *Sequoia giganta* of the Sierra Nevada.

garden in Oakland in 1882. The berry was given to the University of California for distribution to fruit growers of California. The center of production of loganberry juice is in Oregon and Washington. A recent development in the preparation of the berries for distant markets is refrigerated fruit. The berries are packed in barrels and frozen for use in eastern markets.

In the last fifteen years, tomato canning has greatly increased, particularly in California. In 1919 California canned more tomatoes than Maryland, and both produced more than half (in value) of the tomatoes

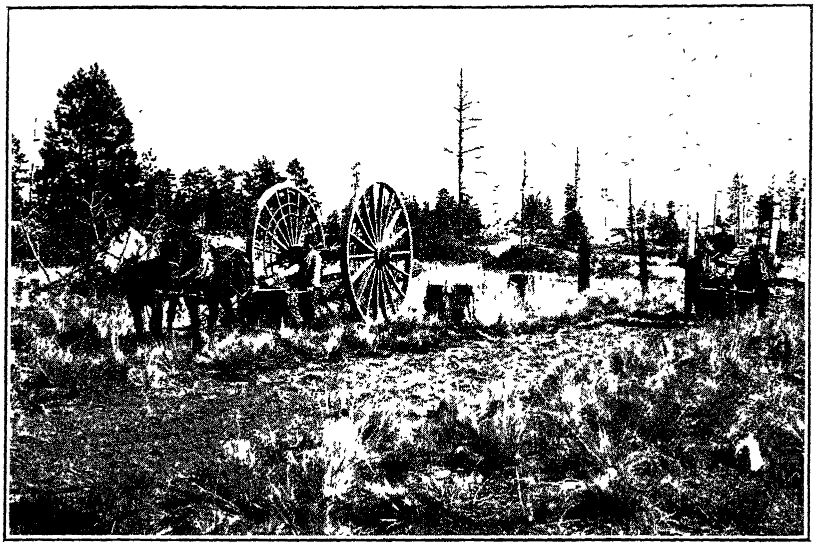


Photo by A. S. Gaskill. *Courtesy of U. S. Forest Service.*

FIG. 210.—Hauling Logs in the Coconino National Forest in Arizona.

In the absence of snow, rivers, and railroads (the scattered trees do not permit economic building of log railroads) wheeled vehicles are used. Saw mills are to be found in some of the towns on the Colorado Plateau.

of the country. The products of western canneries are to be found in most groceries of the country. Rainless late summers and early autumns with bright sunlight and low humidity make California a natural region for the drying of fruits. Nearly all the dried raisins, peaches, and apricots consumed in the United States come from California, and this state produces practically all the dried prunes, and more than a third of the dried apples. The major part of the canning aud preserving of fruits and vegetables in the West is carried on in the smaller towns, and near the berry patches, orchards, and gardens. Most of the plants are coöperatively owned and operated. The products are manufactured under the best of sanitary conditions, and the raw materials used

Much of the wheat of Oregon, California, Washington, and other Western States goes to the flour mills of Seattle, Tacoma, and San Francisco Bay cities. Portland is the leading flour-mill city, since it has easy access to the wheat fields of eastern Washington and Oregon. The Columbia River Valley offers lower railroad grades than are found across the Cascades.

Beet sugar factories are numerous in Colorado (14 factories), Utah (16), California (10), Idaho (8), Montana (1), and Washington (1). The census report does not give complete data for all the states as to the value of product or value added by manufacture. No data are given for Colorado. California produces nearly 18 per cent (value of product) of the beet sugar of the United States, and Utah 19 per cent. Data, by states, are not given for the refining of cane sugar " on account of a disclosure of individual operations." California, it is known, stands fourth in rank among the states of the Union in the refining of cane sugar, Hawaii furnishing raw sugar.

MINING AND METAL MANUFACTURING

Mining has long been one of the leading industries of the West, and the products of the mine are the basis of an active smelting and refining industry.

The Iron Industry.—Iron ores are widely distributed in the Western States, the more important deposits being in Colorado and Utah; but the iron and steel industry is not developed to the degree it is in eastern United States. Pueblo, Colo. the only city of the West that is active in iron making, is sometimes called the " Pittsburgh of the West"; but the output, as judged by the amount of pig iron smelted, is small in comparison with the Pittsburgh area. Excellent coking coal is mined near Trinidad, seventy-five miles to the south of Pueblo, and heating coal may also be secured from Cañon City and Walsenburg. Iron ore is widely distributed in Colorado and Wyoming.

Pueblo supplies steel rails to many of the railroads of the West; in fact, the bulk of the rails used in the West comes from here. Mining machinery, agricultural implements, and other products of the foundry and machine shop are produced in large quantities.

Petroleum Refining.—California is the leading state, as we have seen, in the production of petroleum. The output of the refineries in 1919 was about 13 per cent of the output of the country. New Jersey refined 17 per cent of the product of the United States, and Texas 14.8 per cent. These were the only states that led California, but in " value added by manufacture" California ranked highest. The industry in the West

is largely of recent development, following the great advance made in the production of petroleum. The entire West and many countries bordering the Pacific are the markets for the output of the refineries. Oil-burning locomotives, stationary steam engines, internal combustion engines, and even oil-burning ships consume large quantities of fuel oil.

The Importance of Non-ferrous Minerals.—It is the metallic, and particularly the non-ferrous metallic, minerals that make the Western States one of the greatest mineral regions of the world; and most of the metallic minerals, ores, are manufactured into metals before shipment for secondary manufacture. The East with its immense markets is the destination of most of the more useful metals, as copper, lead, zinc, and others. Here they are used in making hundreds of manufactured articles that command a high price. Thus the West, because of its small population and small consuming public, loses the profits that come from this final manufacture. This condition will long persist, although secondary manufacture will increase with increasing population and extension of markets.

The ores of the more important metals occurring in paying quantities for mining in Western States are copper, zinc, lead, gold, silver, platinum, mercury, nickel, bismuth, chrome, iron, antimony, and tungsten. Of these, copper, zinc, lead, gold, and silver are the most widely distributed, being found in most of the states. Some of these deposits occur as native metal, but most of the ores are chemical compounds that generally occur in a rock matrix called gangue from which they are separated with difficulty. Placer gold is the most common of the minerals that occur as native metal.

The Development of Gold-mining Methods.—The history of mining and metallurgy in the West covers that period of world history during which the crudest methods of mining, reduction, smelting, and refining have been developed into the highly scientific ones of the present day; and the West has contributed its share in this development.

Lode mining—and this applies to all metallic minerals—largely dominates in the West to-day. Since ores occur in many forms, native metal, sulphides, carbonates, oxides, and others, and in all cases associated with much gangue as previously stated, the " reduction " plants of the West are of many types. The first process in the " manufacture " of almost any of the ores is to separate the ore from the gangue. Because most of the ores are heavier than the gangue, stamp mills, or concentrators, using crushing machinery, water, and gravity, are common. There is a tendency for the concentration plants to be near or within a few miles of the mines to save the expense of hauling worthless rock, yet a large supply of water is a prime requisite.

"Metal Manufacturing" at Butte as a Type.—The stages through which copper ore of the Butte district, Montana, passes will serve as a simple definite illustration of "metal manufacturing" in the West and will give one an idea of the factors in the localization of the industry. Low-grade copper ore, containing some gold, silver, and often zinc and lead compounds, is sent by rail from the Butte mines to concentrating mills at Anaconda where there is a large supply of water. The Anaconda plants "enrich" the ore so that it contains from 3 per cent to 8 per cent copper. The ore is next roasted, one phase of the smelting process, coal from nearby mines being used. The product of this process is called "copper matte" and contains about 40–50 per cent copper. This process is similar in many respects to the smelting of iron in a blast furnace. In the convertor which further purifies the copper, greater quantities of fuel are necessary. The copper from the convertor, called "blister copper," is run into molds and forms flat rectangular blocks weighing about 300 pounds each. This is pure enough for many uses. Blister copper may contain silver and gold. If a very pure form of copper is wanted and the recovery of the gold and silver desired, the blister copper is sent to Great Falls, Mont., or the Atlantic seaboard, where there is cheap electricity, either from water power or coal. Here, by a process similar to electro-plating, copper 99.98 per cent pure is obtained.

As in most mining and smelting areas, only the best grades of ore were utilized in the early days in the West. These were smelted without concentration, but later the low-grade ores were mined and concentrated before smelting. Until the last decade or two, large quantities of ore were lost in the tailings at the concentration plant. Present-day concentrating methods recover nearly all the ore, and many tailing deposits are now being re-worked with great profit. Copper is even obtained from the waters from the mines, being precipitated by old iron over which it is made to flow slowly in troughs.

Mining and Metallurgical Districts.—Complete data that would give one the quantitative distribution of smelting and refining in the West are lacking, for many companies deem it necessary to keep the extent of their operations a secret. (Fig. 211.) We know that Arizona, Montana, Utah, Nevada, and Colorado are the leading Western States in smelting and refining. California continues to lead in the production of gold but is not active in its primary manufacture.

The Arizona District.—Arizona probably has the largest smelter output of copper among the Western States, the production, measured in pounds of fine copper, being about three times that of Montana, its strongest Western competitor. New Jersey is, however, the leading

state in the Union in the industry (measured in value of product); yet strange to say, the value added by manufacture in New Jersey is much less than in Arizona. The leading copper mining region of Arizona is in the southeastern and central parts of the state, the Bisbee, Jerome,

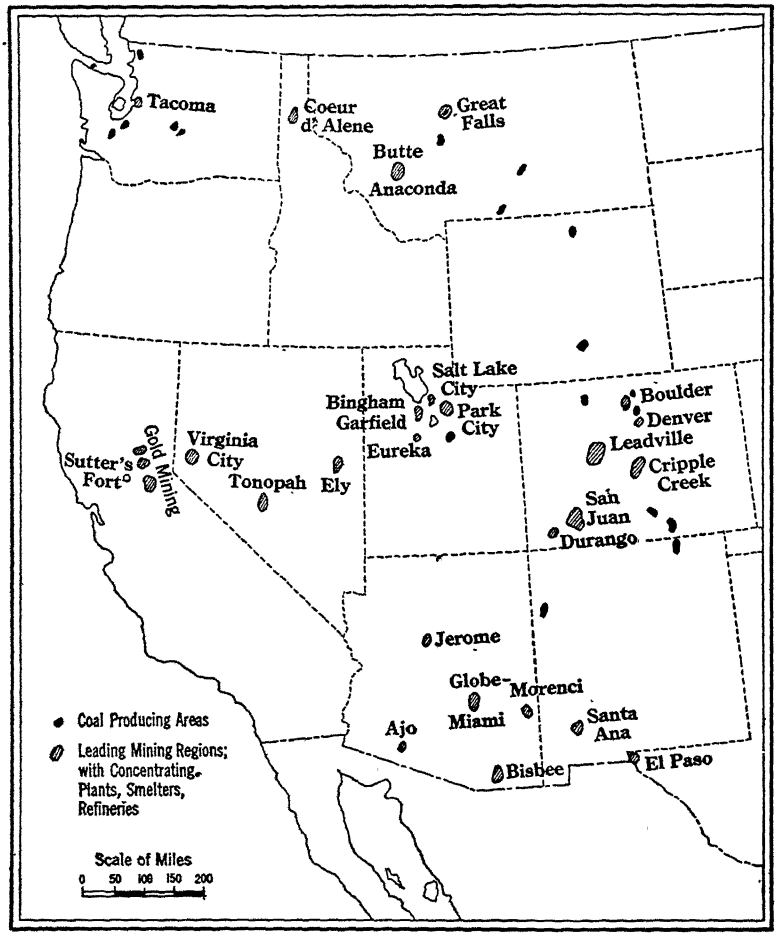


FIG. 211.—The Leading Mineral Regions of the West.

Morencia, Metcalf, and Globe-Miami districts. Bisbee is the most important. The Arizona Copper Company has a large smelter at Clifton near the Morenci mine. As early as 1738, silver nuggets were found in the gravel of some streams in Arizona and, as earlier stated, gold was found in the channels of the Gila and Colorado Rivers. Tomb-

stone was once an active gold-mining camp but gold mining has long since given way to the mining and metallurgy of copper.

The Butte Region.—The Butte area of Montana is considered one of the greatest mining centers in America if not in the world. Much more than a billion dollars' worth of metallic ores have been taken from the ground. The mines fairly honeycomb the hills on which Butte and other nearby towns are built, and scattered through the urban centers are tall smoke stacks, steel hoist frames, machine shops, dingy mine buildings, railway yards, and all the accompaniments of deep mining. The first smelter erected in Butte was completed in 1880. In 1883 the Anaconda Copper Company began the construction of what is probably the largest smelter in the world, in Deer Lodge Valley, about 27 miles from Butte. Here grew up the city of Anaconda. The capacity of this great plant is about 12,000 tons of ore a day. A smaller smelter has been erected at Great Falls on the Missouri. There is at present only one smelter at Butte, but in former days smelting was much more active. This former activity is read in the great number of dead trees and shrubs, destroyed by the acid fumes from the great smokestacks; even the soil was poisoned for plant life and it is only in recent years that vegetation is getting a fresh start. A similar destruction was begun at Anaconda, but the company a few years ago was forced to put in a by-product plant. Sulphuric acid is now produced, and reaches the eastern markets, when the price is high enough to pay the heavy freight charges.

Copper mining in the Butte area was preceded by gold and silver mining. Gold placers were discovered about 1864 on the site of Butte, and within a few years yielded $1,500,000 or more. Silver mining was also attempted, but without financial success until the erection of a stamp mill in 1876. Since 1893, owing to the decline of silver prices, there has been little mining of silver. Copper veins were discovered before 1865, and smelting in crude furnaces was attempted in 1866. In the seventies copper ore was hauled 400 miles in wagons to Corinne, Utah, where it reached a railroad that carried it to smelters in the eastern United States. Some of this copper in a concentrated form found its way even to the smelters of Swansea, Wales. Since about 1880, owing to the completion of the Butte smelter and the Utah Northern Railroad (now Oregon Short Line), which gave connection with the Union Pacific, the copper mining and smelting in the Butte district has been active. The prosperity of the Butte region attracted the Northern Pacific Railroad, and it completed a line into the mining district in 1888 although it had reached Helena in 1883.

The Utah District.—Mineral prospecting in Utah was delayed for many years by the adverse attitude of the Mormon Church, but in 1863

soldiers of the United States Army, stationed at Fort Douglas, discovered valuable ores in Bingham Canyon. Copper was first shipped in 1868, the first lot going to Baltimore, Md., since there were no smelters in the West. Bingham to-day has the largest single mine in the world. (Fig. 212.) The ore outcrops on the side of a gulch, the face of which is 1600 feet high, and is mined at a very low cost by steam shovels working on

Courtesy of the Utah Copper Company.

FIG. 212.—Bingham Canyon and the Open Cut Copper Mine.

The small mining town of Bingham lies at the bottom of the canyon. The copper ore deposits are in the hill in the middle background, the top of which is about 1600 feet above the canyon bottom. The entire hill is being removed by electric shovels (twenty-three in number), working on some fifteen to twenty levels. By numerous switchbacks and horseshoe curves, the ore cars, hauled by small engines, carry ore from all the levels to the railroad track above the village, on the right, which leads out of the Canyon to Garfield, nineteen miles distant. This track has standard railroad equipment.

Mining has been in operation here for more than fifty years. During this time more than 300,000,000 tons of ore and overburden have been removed.

many levels. Nearly 50,000,000 tons of ore have already been removed, and exploratory drilling indicates a reserve of nearly 400,000,000 tons. During the first fifty years of its operation, the output of copper, zinc, gold, silver, and lead was $280,000,000.

There are two large concentrating plants at Garfield, the larger covering 20 acres. From the concentrating plants the "enriched" ore is

taken to the smelter just to the west of Garfield. There are smelters also at Murry and Midvale, suburbs of Salt Lake City, and at Milford and Ogden.

Park City, on the east slope of the Wasatch, is another great mining district, the rock here carrying silver, lead, zinc, gold, and copper. The Tintic Mountains, to the southwest of Utah Lake, have deposits of silver and lead.

The Leadville District.—The Leadville mining and smelting district is remarkable in its variety of minerals. It was gold, discovered by prospectors in the boulders and sand deposits of California Gulch, that attracted hundreds of miners in 1860 and resulted in the founding of Ore City, which in less than a year had 10,000 people.

The history of this city illustrates how short-lived is a community built up entirely on mineral deposits, particularly on precious and semi-precious minerals. It began as a gold camp in 1860, became a silver-lead producing area by 1879, and, following the decline of these industries became a lead and zinc producing region. It still produces gold, silver, and lead, but zinc leads. Copper began to be mined about 1889 but only in small amounts. Local copper smelters work up much of the copper ore of the area. Iron, manganese, and bismuth are also found. There are several smelters at Leadville, but not all the primary manufacture is done here, some ore being sent to Pueblo and Denver.

Historic Mining Towns in Colorado.—But few of the mining towns that date from the "gold fever days" have been as successful as has Leadville in holding a place in the mining world. Many a "Queen of the Rockies" of the fifties, sixties, and seventies is now wholly deserted. The number of public buildings, schools, stores, churches, and the inevitable saloons and dance halls, with weathered exteriors, sagging roofs, broken windows, and gaping doors, are indicative of the number of people, gathered from every quarter of the globe, that called them home. Among the larger historic towns are Carbondale, in western Colorado, Bachelor, Teller, Robinson, American City, Pearl, Nevadaville, Lulea, Tincup, and Gothic.

Other Districts in Colorado.—Cripple Creek has many smelters and cyanide extracting plants for treating copper, silver, and gold ore, but most of the ore taken from the numerous mines is sent elsewhere. The San Juan district in southwestern Colorado, about the cities of Telluride, Silverton, and Ouray, produces gold and silver. There are large ore-reducing plants at Denver, Durango, and Salida. Pueblo, besides being a large iron and steel center, is one of the greatest smelting centers west of the Mississippi. The numerous railroads which pass through the city bring ores from the mountain valleys and carry the smelter

products eastward to the Atlantic seaboard states for further manufacture.

The Nevada District.—Mining and the primary manufacture of ores are the chief activities of the people of Nevada. At present about 90 per cent of the ore mined is refined in the state, but the metal obtained is sent elsewhere for further manufacture. The Comstock Lode, near Virginia City, as earlier stated, furnished the first silver and gold ore for refining. Mining here has been a great gamble, for the veins vary greatly in richness; in some places the rock yields several thousands of dollars a ton; in others, very little. Since before 1880, the mines near Virginia City, and consequently the output of the concentrating and refining works, have been declining. The great importance of this mineral region in the economic life of the state is indicated in the decline of population. In 1880 the population of Nevada was more than 62,000; in 1900, a little more than 42,000. Subsequent discoveries of gold, silver, and copper deposits in the Goldfield–Tonapah district and in other districts both to the north and south, a slight increase in the output of the Comstock mines, and continued activity in the eastern part of the state brought prosperity for a time, and the population increased to nearly 82,000 in 1910, but fell to 77,000 in 1920. In 1927 gold was found at Weepah, and a "rush," bearing many of the characteristics of former days, was on. The most active section of the state to-day in the metal industry is in the Ely district in eastern Nevada. Here is produced about 98 per cent of the copper of the state, besides lead and zinc. Concentrators and smelters prepare the metals, chiefly copper, for shipment. Lead ore is sent to Salt Lake City, and zinc ore to Iola, Kan. A very large cyanide mill has recently been erected near Virginia City for treating the low-grade ore of the Comstock Lode; thus this great deposit which is credited with having yielded more than $400,000,000 worth of gold is further to enrich its owners.

QUESTIONS, EXERCISES, AND PROBLEMS

1. Will the West ever have a city as dominant among western cities as New York is among the cities of the East? Give reasons for your answers. Consider all the factors, particularly those affecting the growth of manufactures.

2. Classify the larger urban groups of the West as to location and geographic conditions affecting their growth. What ones are likely to be great industrial centers in the future?

3. Is it possible for California to develop an important iron and steel industry? Where is the best location for iron and steel plants in the West?

4. Make a study of the influence gold has had on the settlement and economic growth of the West. Has it affected the social conditions? There is enough material here for an excellent paper in historical geography.

5. Make a careful and detailed study of such mining centers as Leadville, Butte, and Virginia City. Do metallic mineral deposits lead to such permanence of settlement as coal beds? Give examples to prove your conclusions.

6. The Chamber of Commerce of Salt Lake City advertised in 1927 as follows: "The immensity of Utah's mineral resources staggers the imagination! Copper, zinc, gold, and silver from Utah already have added $1,750,000,000 to the world's wealth—and these minerals are still coming from year to year. . . . In 1926 Utah ranked first among all States in silver production, furnishing about 21 per cent of the nation's total; was second in lead, furnishing 18 per cent of the nation's output; was third in copper, producing 13 per cent of the total; was fourth in gold. In addition, 33 per cent of the nation's arsenic, 13 per cent of the potash, and 6 per cent of the asphalt came from Utah. . . . The value of Utah's mineral production in 1926 was $119,270,000. . . ." Test these claims. Data may be secured from the Statistical Abstract and Mineral Resources.

7. Compare the mineral output of Montana with that of Utah; also those of Colorado and Arizona with that of Utah. Compare the total mineral production of Utah with that of Pennsylvania.

CHAPTER XXI

ALASKA

A Land of Retarded Development.—Alaska was first visited by the Russians in 1741, and Russian traders and trappers soon entered the country to obtain fur. They established the first settlement in 1784 on Kodiak Island, and in 1804 founded Sitka, which became the seat of government the following year. During the eighty-three years that Russia occupied Alaska it obtained $45,000,000 worth of furs but did little to develop the colony. The 500 colonists were even provided with food from Siberia. Russian rule ended in 1867 when the United States purchased Alaska for $7,200,000. It was then popularly known as an arctic waste suitable only for primitive natives, trappers, and hunters. Fine furs were thought to be its only asset, and little attention was given to the territory for many years. For a decade it was in charge of the War Department with no government at all except near the army posts, and for seven years more it was under the Treasury Department. Nearly fifty years elapsed before Alaska had any form of local government. During that time it was administered from Washington, 5000 miles distant. It was given a homestead law in 1903, the right to export timber in 1909, a Territorial Legislature in 1912, a coal-land leasing law in 1914, and an oil-land leasing law in 1920.

The negligent and dilatory attitude of Congress toward Alaska has been ~~an important~~ factor in retarding development. It is still a frontier land, a vast undeveloped territory of 590,800 square miles, a land containing resources of great potential wealth but with few people. The population has risen and fallen with the rise and fall of gold production. Hopes of a fortune quickly obtained brought a rush of prospectors, and failure to realize those hopes caused them to leave. In 1920 the population was only 55,000—about the same as that of Lincoln, Neb. and more than three-fifths was in the southern and southeastern districts. Nearly half the total population consists of Indians and Eskimos. There are only five towns with more than a thousand people, Juneau being the largest with 3000. More than 99 per cent of Alaska is still owned by the Federal Government, and both Federal and Territorial income is collected as taxes or licenses chiefly from the fisheries and

business enterprises. Some hold that development of a frontier country like Alaska cannot progress far under present leasing laws, while others hold that these laws are adequate for present needs and will prevent acquisition of Alaska's wealth of resources by a few individuals or corporations. Whatever may be the correct viewpoint, it is certain that progress of a substantial nature can come only with the establishment of permanent industries. It is also clear that man will not risk large investments in a frontier country like Alaska unless large profits are reasonably certain.

Past Production and Future.—White men tend to go where great potential wealth exists whether the laws of a stable government are there or not. This has been more or less true in Alaska. Notwithstanding the mining and leasing laws that have been in force, Alaskan products for the period 1867–1923 were valued at $1,133,000,000. More than nine-tenths of this huge sum was derived from salmon, gold, copper, and seal. The mineral output and fish products each exceeded $500,000,000 and the value of the furs taken was more than $89,000,000. The total value of the products for the period stated is 157 times the purchase price; more than 10 times the total sum expended on Alaska exclusive of revenue obtained from its industries; and more than 40 times the net cost to the Federal Government for current expenses. To state this in another form, if the purchase price and the cost of permanent improvements be charged to investment and revenue credited, the total income produced by Alaska equals a return of 1457 per cent on the Federal Government investment.

It appears that only a small fraction of the mineral and other resources has been taken. Minerals of excellent quality, in great variety, and in large amounts still remain. The coal deposits exceed 30,000,000,000 tons; usable water power is abundant in the southern part, and prospects for producing petroleum on a commercial scale are considered good. The fisheries may be expanded and continued indefinitely under proper conservation regulations. The splendid forests are awaiting utilization. The immense acreage of agricultural and grazing lands is almost wholly unexploited, though a start has been made. Greater production of raw materials and finished products for export, development of adequate interior transportation facilities, extension of manufacturing industries based upon utilization of local raw materials and power, and establishment of permanent local markets for the products of agriculture and grazing are all in the future. With their growth will come greater commerce and population. Alaska is yet a land for the pioneer. *Is Alaska suitable for a permanent home for white men in any considerable numbers? Do Alaskan resources warrant the conclusion that a population equal to*

that of Finland or of Sweden can be supported? Can Alaska ever become of importance as a home for man? Grave doubt exists in the minds of most people.

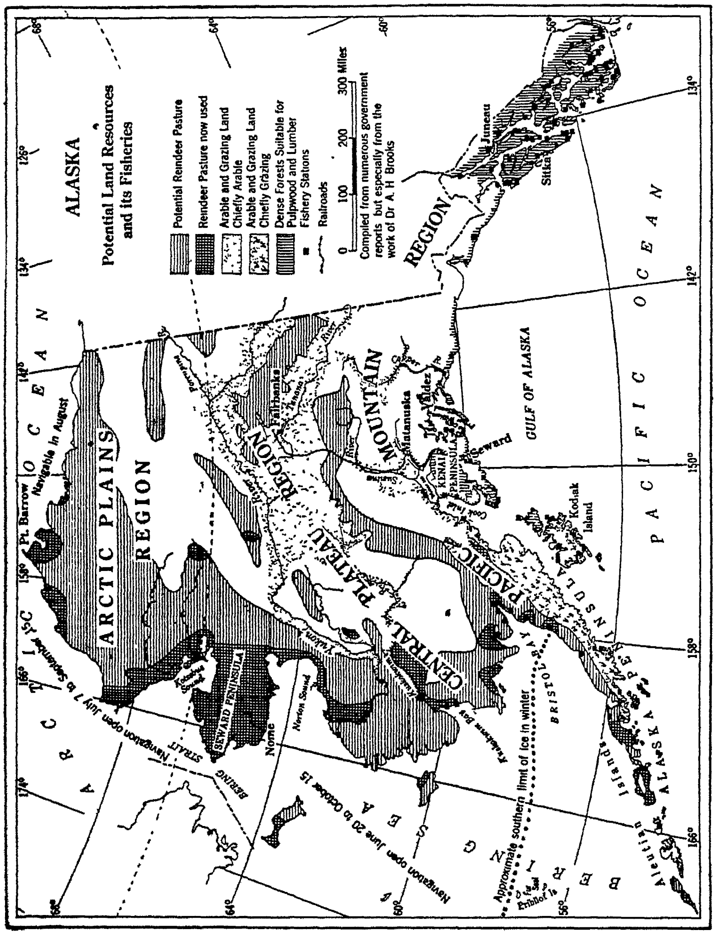


FIG. 213.—Major Physiographic Regions of Alaska, its Potential Land Resources, and its Fisheries.

GEOGRAPHIC REGIONS

Alaska may be divided into three broad geographic provinces that present striking contrasts in surface, climate, vegetation, mineral resources, agricultural possibilities, and consequently in the opportunities for human use. These provinces may be designated as (1) the Pacific Mountain Region, (2) the Central Plateau Region, and (3) the Arctic Plains Region. The Territory has a very wide range of climate with a corresponding range in native vegetation, varying from dense

forests, through the semi-arid type, to arctic tundra. These large variations are due to (1) great latitudinal extent, (2) the temperature of bordering waters—the warm Pacific, the cold Bering Sea and Arctic Ocean, (3) the direction of prevailing winds, and (4) the distribution and high altitude of the mountain ranges. The mean annual temperature varies from 40° in the south to 10° in the north, a greater range than prevails in the continental United States. (Fig. 215.)

The Pacific Mountain Region.—The Pacific Mountain Region is a continuation of the rugged mountainous district of the United States and British Columbia. It is a region of high relief and of great valleys, and extends some 1200 miles along the coast and about 200 miles inland.

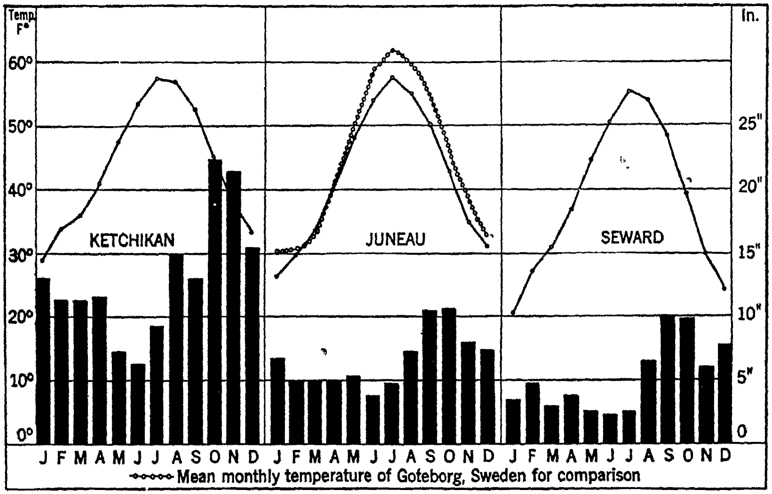
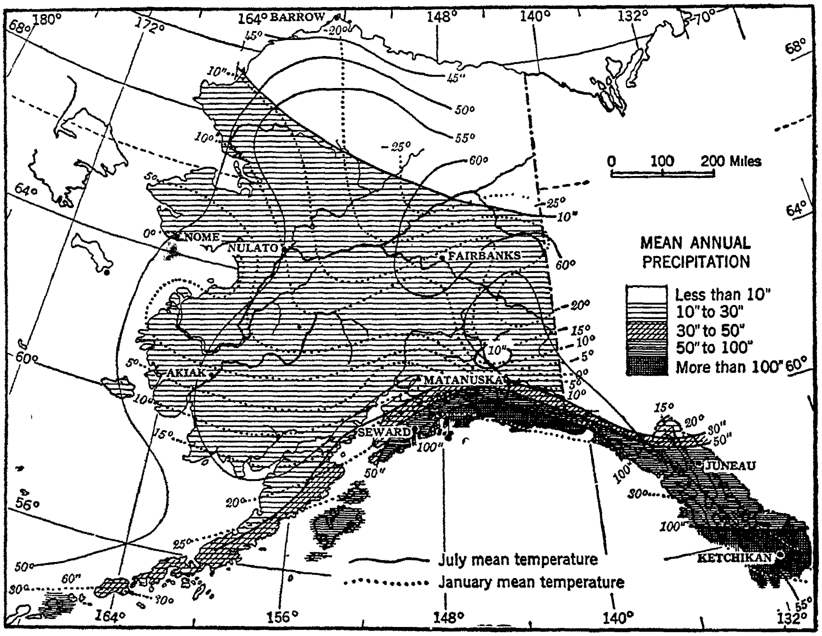


FIG. 214.—Mean Monthly Precipitation and Temperature at Three Stations Along the Pacific Coast of Alaska.

Numerous snow-capped peaks rise to high altitudes, such as Mt. McKinley (20,300 feet) in the Alaska Range, and scores of large glaciers descend to the coast from the extensive snow fields. It is a region of cool winters and mild summers (Fig. 214), and very heavy precipitation, ranging from 50 to 120 inches annually. Snowfall on the higher slopes is heavy. Contrary to popular belief, the mean winter temperatures of Sitka, Juneau, and St. Louis, Mo., are nearly the same, but the extreme minimum of St. Louis is much lower. Seventeen of the twenty-five Weather Bureau stations on the Pacific Coast of Alaska have never recorded temperatures lower than the St. Louis minimum of −22. The summers, however, are cool, damp, and chilly. The lower mountain slopes are heavily forested with such valuable trees as hemlock,

spruce, and cedar. Nearly all of the best timber is included in the Federal reserves. The extensive forests comprise more than 26,700,000 acres and contain about 77,000,000,000 board feet of timber suitable for pulp and lumber. Much of the timber is now fully ripe and should be utilized at an early date. However, it probably cannot now compete in outside markets with the lumber of higher quality and greater variety available in Oregon, Washington, and British Columbia. The annual cut is now about 50,000,000 board feet, a large part of which is



After U. S. Weather Bureau maps.

FIG. 215.—Mean Annual Precipitation and Mean Temperatures for January and July. Compare with graphs showing monthly distribution.

used for salmon cases. Fish, forests, and minerals are the principal economic assets of the region. Agriculture, except in favored localities, is not likely to attain much success, as the arable land is limited and the cool, damp summers are unfavorable.

The Central Plateau.—The Central Plateau Region contains about 200,000 square miles, an area nearly as large as that of Nebraska and the two Dakotas combined. It is of relatively low relief, characterized by flat-topped highlands separated by broad stream valleys and lowlands, except along the Bering Sea section where broad lowlands broken by low, rounded hills dominate the landscape. Within it lie the basins.

of the Yukon ~~and Kuskokwim~~, the first being Alaska's great highway in summer, as it is navigable for 2200 miles. This is a country of short, mild summers with eighteen to twenty hours of sunshine daily; the winters are long and cold (Fig. 216); and precipitation is scant (9–19 inches) with very little snowfall. The region contains most of the agricultural lands of Alaska and is rich in minerals—its two chief resources. A vast wealth of gold has already been obtained from the alluvial gravels. About two-thirds of the area is forest of the woodland or small open-growth type. However, not more than half of the forested area carries timber suitable for commercial purposes and that cannot be utilized for more than local uses until transportation is provided. The principal species are white and

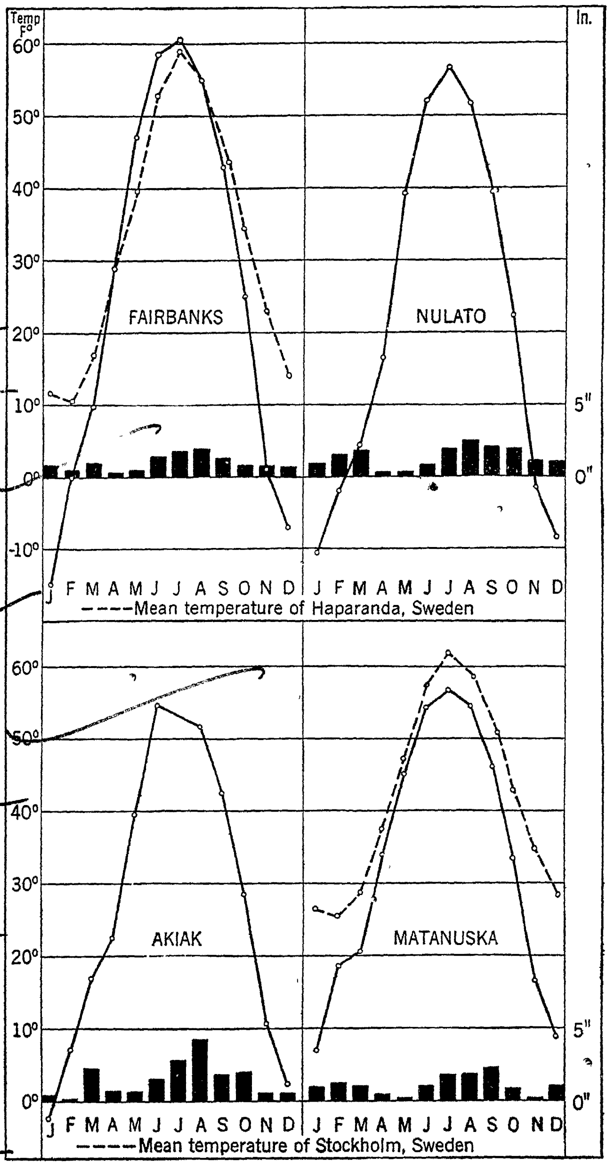


FIG. 216.—Mean Monthly Precipitation and Temperature at Four Stations in the Central Plateau Region of Alaska.

black spruce, white birch, balsam poplar, black cottonwood, aspen, and tamarack. Its forests are mere "scrubs" compared with those of the Pacific Region, varying from almost nothing in the stunted black spruce areas to 20–30 cords per acre in the birch and aspen sections, and several thousand board feet per acre in the best white spruce areas. Highly valuable pastures occur over much of the area and offer opportunity for the grazing of reindeer.

Arctic Plains Region.—The northern region, separated from the Central Region by the Brooks Range, contains about a sixth of the Territory and may be truly called Arctic Alaska. It is a region of more or less rolling low relief, a slightly elevated plateau dissected by northward-flowing streams. Its climate is of the true arctic type, with only about 6–8 inches of precipitation, long, cold winters, and cool summers. Summer extremes of 66° and winter extremes of −54° have been recorded. The long period of continuous sunshine, extending through days and weeks except when the sky may be obscured by clouds, produces a luxuriant growth of mosses, flowers, lichens, and grasses over much of the area even though the soil cover thaws to a depth of only a foot or two before winter sets in again. So far as is known, the mineral resources of the region are small, though coal and petroleum are present. Production of reindeer or muskox upon its extensive pastures is probably the greatest opportunity that it offers to man.

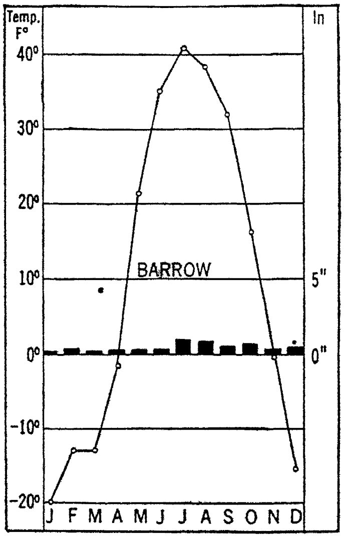


Fig. 217.—Mean Monthly Precipitation and Temperature on the Arctic Coast of Alaska.

MINERALS

Alaska is rich in minerals. There are large reserves of gold, copper, coal, silver, platinum, tungsten, lead, marble, gypsum, and numerous other minerals, all of which are likely to be of significance in the future development of Alaska. A small amount of petroleum is now produced, but little is known about the reserves. The mineral resources are widely distributed throughout the Central and Pacific Regions. (Fig. 218.)

Gold first attracted large numbers of people to the Territory, and it

has also held many of them there, since they have a permanent interest in Alaska in contrast with employees of the fish canneries. When a man can wash a fortune from the gravels in a short time with no more equipment than pick, shovel and pan, he can pay costly transporta-

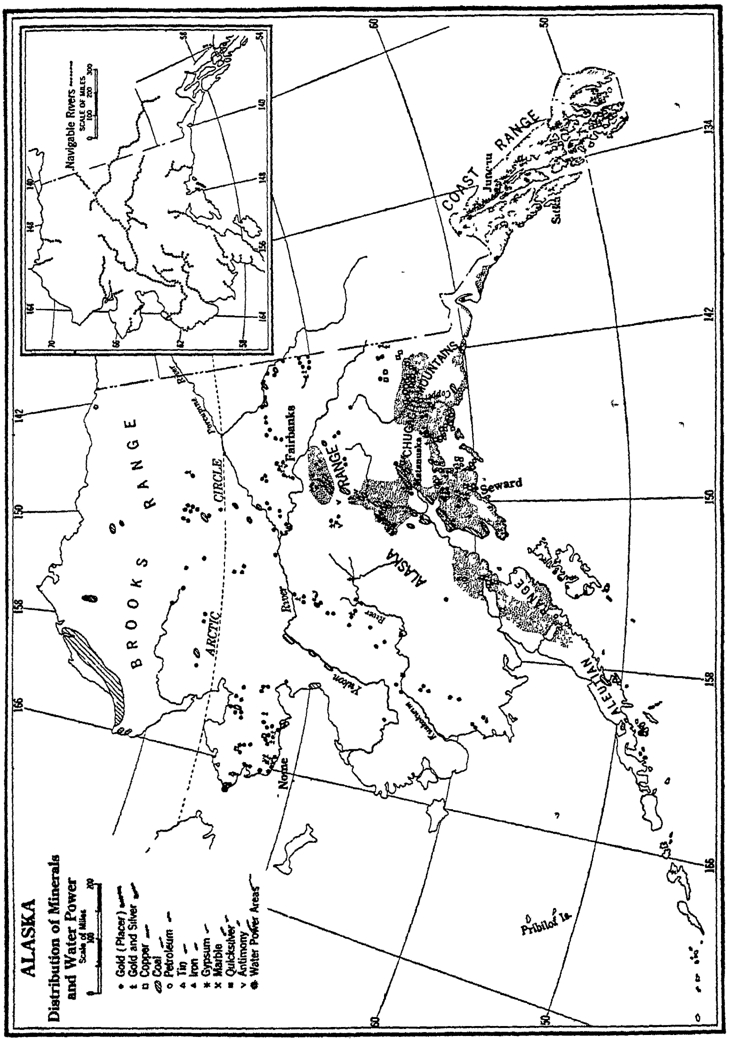


FIG. 218.—Distribution of Alaska's Minerals and Navigable Rivers.

tion and endure hardships. Under these conditions alluvial gold mining developed rapidly for a time along the Yukon and other interior streams. As the bonanzas became exhausted and the yield per cubic yard of gravel became small, production declined. Large power-driven equipment is necessary to work such deposits profitably. Its use requires transporta-

tion facilities, far more of which must be provided before the mineral reserves can be exploited. The reserves of alluvial gold probably exceed in value all that has been produced to date, which is more than $200,000,000. Two decades ago three-fifths of the mineral output came from remote districts without good transportation and in recent years only a twentieth. Hard rock or lode mining can be conducted only where steamers, railroads, or good highways are available and freight rates relatively low. Hence 97 per cent of the gold taken from lodes has come from mines situated near the coast. More remote deposits must await cheaper means of transportation than now exist. Up to 1923 the total value of gold produced in Alaska was 47 times larger than the price paid to Russia for the entire territory. Furthermore, the gold value alone is more than twelve times the net cost to the Federal Government for cur-

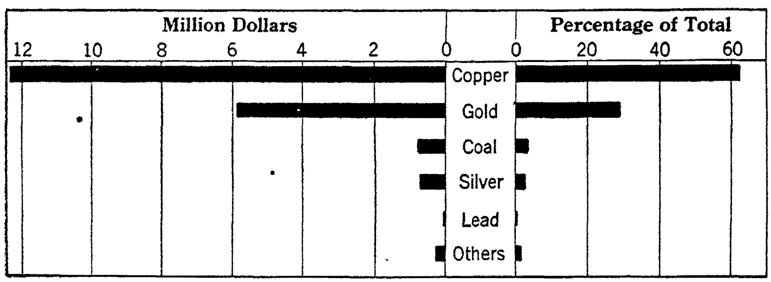


FIG. 219.—Alaska's Mineral Production in 1923.

The copper produced annually in Alaska is more than twice as valuable as the gold.

rent expenses since the purchase in 1867. And the total value of gold is only three-fifths that of the fisheries!

Copper mining is in its infancy though the annual output is more than twice as valuable as that of gold. It is now produced in districts served by railroads or steamers, as in the Copper River valley and near the coast. Copper deposits, however, are widely distributed, and about a hundred are likely to be of commercial size. Coal deposits are also widely distributed, and the reserves are estimated to be about 30,000,000,000 tons, at least half of which can be made available easily. Most of the reserves are of subbituminous coal and lignite, but the fuel value of the Matanuska and Bering River coals is as high as that of any other coal on the Pacific Coast. The Alaska Railroad now serves the Matanuska field where most of the present small annual production of 120,000 tons is obtained. Other deposits along this railroad are now being developed. Coal mining by private companies was not feasible until 1914 when the Government enacted a coal-land leasing law. The

demand for coal in Alaska and on the Pacific Coast of the United States is sufficiently large to absorb all that can be mined for several years to come. (Fig. 219.)

FISH AND FUR

Fisheries.—The fisheries are the most important industry and were the first to be developed extensively. (Fig. 220.) Fishing was carried on by the Russians long before the purchase of Alaska by the United States, and many American fishermen visited its shores regularly while it was still a Russian colony. The first salmon canneries were not built until 1878. In 1923 there were 130 in operation, and the total value of the salmon products was $34,000,000, which was nearly nine-tenths of the total

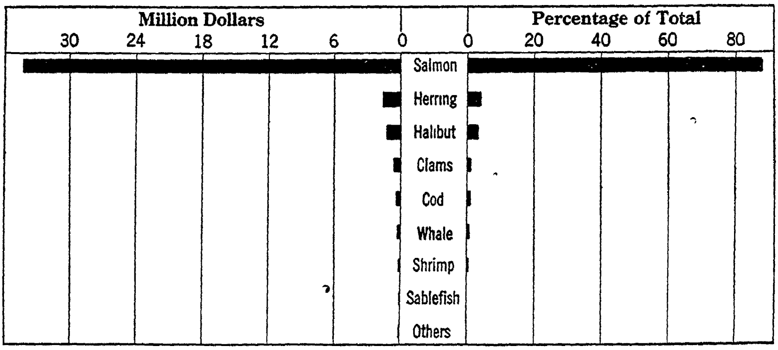


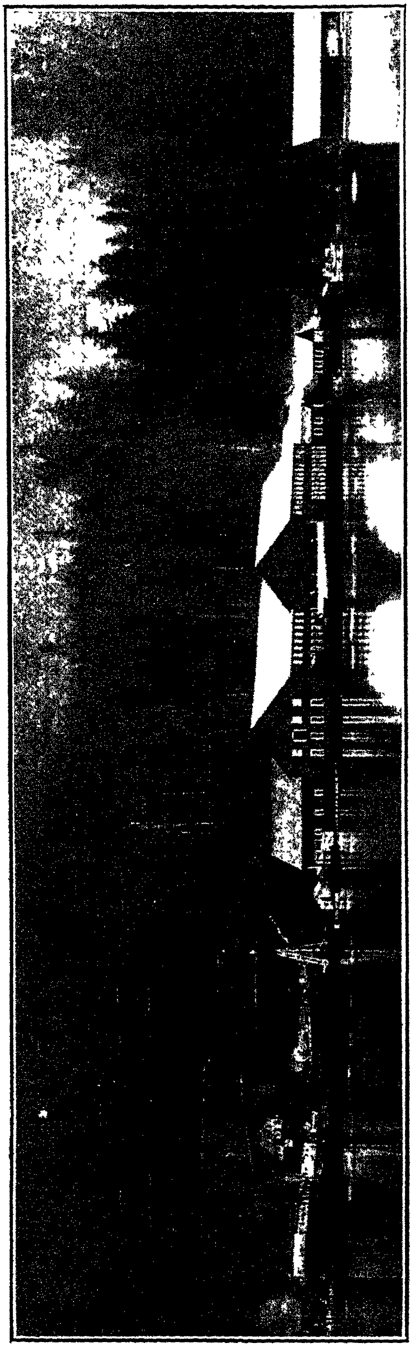
Fig. 220.—Value of Alaska Fisheries in 1923.

Nearly nine-tenths of the total value of Alaska's fisheries is derived from the salmon.

value of all fish products exclusive of aquatic furs. The value of all fish products for the same year was nearly twice that of all minerals mined, and the aggregate value since Alaska was purchased in 1867 exceeds half a billion dollars. It has been estimated that "The amount of food obtained from salmon in the war years is equivalent to that furnished annually by three and a half million head of cattle, for the support of which seventy million acres of natural pasture is needed."[1]

Fish are taken throughout Alaskan waters, but the investment in the fisheries of southeastern Alaska is nearly equal to that of the western and central districts combined. Salmon, halibut, herring, cod, and whale are the principal fish now utilized. Salmon streams are found along more than 2500 miles of coast, and in the Yukon salmon spawn 2000 miles inland. The young salmon finds its way to the sea, where it

[1] A. H. Brooks, Geographical Review, Vol. 15, p. 39.



Courtesy U. S. Bureau of Fisheries.

FIG. 221.—A Salmon Cannery in Southeastern Alaska.

Note the dense forest that extends to the shore line, and the dense fog that enshrouds the forest.

remains until it is from two to five years old, when it returns to fresh water to spawn. At that time immense shoals of salmon gather along the Alaskan shores, and it is then that huge numbers are caught. Since the largest runs occur periodically with corresponding years of smaller runs, the fishing industry fluctuates in harmony with the habits of the salmon. In 1923 all fisheries gave employment to 25,200, which was 3200 more than the year before. There was also a similar variation in the number of canneries in operation. Investigations show sufficient salmon to maintain the commercial fisheries indefinitely under present conservation laws.

Fur Industry.—The search for fur first brought the Russians to Alaska, and fur remained the chief interest of the country for more than a century. Ruthless killing nearly exterminated the sea otter, and likewise the seal of the Pribilof Islands. Formerly, not less than 3,000,000 seal visited these islands annually, but the number had been reduced to only about 125,000 when the Federal Government took over the sealing industry in 1911. By 1924 the herd had grown to 697,000 and,

if the present methods of conservation are maintained, may regain its former size. The annual kill of excess males is now about 15,000–20,000. Alaska has many valuable fur-bearing animals and now produces nearly $3,000,000 worth of fur annually. About three-fifths of this amount is obtained from the seal, and more than a third from the fox, muskrat, and mink. (Fig. 222.) With the advancement of settlement, a fur industry based upon the capture of wild animals naturally declines. However, fur farming may be extended almost indefinitely and thus develop a profitable and permanent industry.

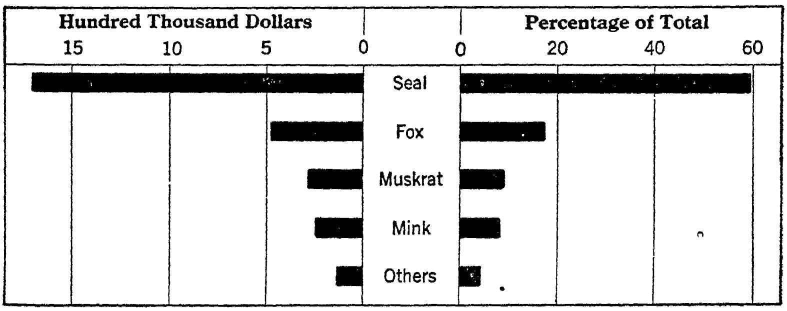


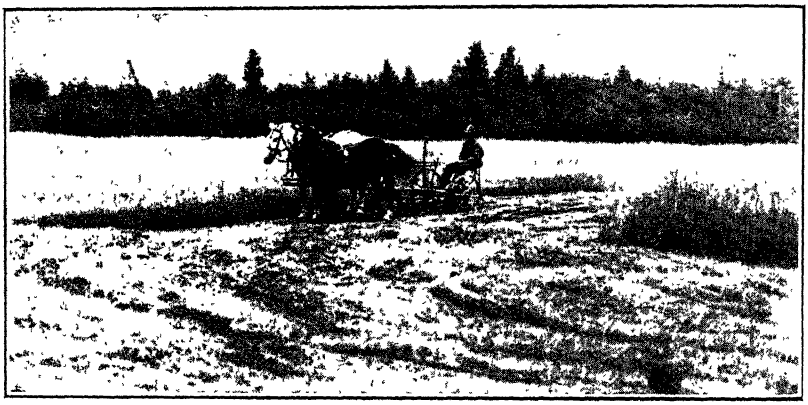
FIG. 222.—Fur Shipped Out of Alaska in 1920.

The seal provides nearly three-fifths of the value of all fur shipped out of Alaska annually.

AGRICULTURE AND GRAZING

The feasibility of agriculture and grazing in Alaska has been demonstrated, since crops and live stock have been produced by white men for more than a century. Though the agricultural resources are almost wholly undeveloped, crops of wheat, rye, oats, barley, hay, and potatoes and other hardy vegetables are produced for local consumption. The harvested acreage in the Territory in 1919 was only 4470 and the products were valued at $393,900. The most extensive development has taken place in the Fairbanks section where the farm produce found a ready sale in the towns and mining camps. Present crop production in Alaska is limited by transportation facilities and markets rather than by either climate or soil. Until time changes these conditions, large crops cannot be produced profitably as Alaska's farmers cannot compete in exports with other countries. Present production, therefore, is merely indicative of what may be produced in the future. When the more desirable lands of the continent are taken up and the pressure of population is felt, as it has long since been felt in Europe, Alaskan agricultural lands will be used.

Arable Land.—Estimates of Alaska's cultivable and grazing lands vary from 65,000 to 100,000 square miles, probably half of which is suitable for cultivation. These estimates are exclusive of 150,000–200,000 square miles of reindeer pasture. The principal areas where agriculture can be most successfully conducted are in the valleys of the Yukon, Tanana, Susitna, Matanuska, and Copper rivers, and the west side of Kenai Peninsula. Much of the best class of farming lands is in the Susitna and Matanuska valleys which are traversed by the Alaska Railroad. There are probably 5,000,000 acres of arable land within a hundred miles of this trunk line. In the Susitna–Matanuska and Cook Inlet region alone, there are about 1,300,000 acres suitable for farming without expensive drainage. This fraction of the area would provide 8100 farms of 160 acres each. It is significant to note that the minimum estimate of 65,000 square miles is more than two and one-half times larger than that of similar lands in Sweden and nearly seven times those of Finland, two countries that now have agricultural populations of 2,800,000 and 1,000,000, respectively. Alaska also has large areas of land not considered of agricultural value, though poorer lands in parts of Europe are now producing crops. Most of the arable land is in the Central Plateau Region which is climatically best suited to the growth of crops. (See maps.) Fully half the area has a growing season of 70–105 days and a maximum of 18–19 hours of daily sunshine during the summer period. The scant rainfall is a greater influencing factor than either temperature or growing season. The grazing season for cattle and sheep is only about 100 days, though there is some winter pasture in the drier



Courtesy Alaska Weekly.

Fig. 223.—A Farm Scene near Fairbanks.

There are a number of good farms and farm homes in this district.

parts. Eight to nine months of indoor feeding is a handicap to live stock production, and hence it is carried on only incidental to mixed farming. The area of agricultural land in the Pacific Region outside of Kenai Peninsula is relatively small and, in general, the land is more valuable for forest growth. A notable exception is some 8000 square miles on the Alaskan Peninsula, Kodiak, and adjacent islands that carries a luxuriant growth of grass. Cattle and sheep may be pastured for six to eight months each year, and continuously in favored localities. These grazing lands are within 50 miles of ocean waters navigable throughout the year. The problem of winter feeding is yet to be solved, as the heavy summer rains are not favorable to the curing of hay. It appears probable that root and forage crops for ensilage may be the solution. Furthermore, the mosquito is a much less serious pest in this district than in the Central Region.

Soils.—The soils of Alaska are of fair fertility. Only in the immediate vicinity of the streams can they be called rich and deep. Much of the agricultural area is wooded, and the ground is covered with moss. Both the timber and moss must be removed before crops can be raised. The heavy covering of moss is a poor conductor of heat, and beneath it the ground remains frozen. Much of the ground ice is a survival of a former colder climate and disappears or sinks to a level that permits crop growth when the moss is removed and the land cultivated. The ground ice that remains in cultivated lands during the dry summer is an advantage as it prevents drainage and supplies moisture to the crops. Where the soils are dominantly peat, from the accumulation of partially decayed vegetable matter, drainage is needed; in the driest parts of the interior irrigation may be necessary, though moisture supplied by the ground ice may prove sufficient.

So far as climate, soil, and topography are concerned, sufficient food can be produced to support a population of several million people. However, good accessible markets are essential to large crop production. The sparsity of markets for Alaskan agricultural products is in contrast with the abundance of such markets available to the farmer of Sweden and Finland. Further growth of agriculture, therefore, must await the establishment of other industries on a more extensive scale than exists at present, the more complete occupation of more favorably located lands elsewhere, and the development of adequate transportation facilities.

Reindeer Industry.—The raising of reindeer for meat undoubtedly offers the greatest immediate opportunity for utilization of Alaska's pasture lands. Perhaps reindeer are to be the forerunner of agricultural settlement, as cattle were in the United States proper. However, vast

areas suited only to the reindeer, or some similar animal, will remain after the agricultural land is taken up. The first small herd of 10 was introduced in 1891. From the natural increase and by subsequent importations, the number has grown to about 350,000, and at least 100,000 have been killed for food and clothing. The practicability of the industry has been fully demonstrated. Between 150,000 and 200,000 square miles of natural grazing lands are available and are capable of maintaining three to four million head. It is probable that the annual meat production from such a herd would exceed in value all the precious metals mined and would be second only to the fisheries as a permanent source of income. At least a million reindeer could be maintained on lands that are now sufficiently accessible for profitable use.

TRANSPORTATION AND COMMERCE

Transportation.—Modern man will not make his permanent home far from a modern system of transportation. Rivers serve fairly well in a new country, but if development is to take place more efficient means of moving men and goods are essential. Because of its great size, wide distribution of important resources, and long distance from American and foreign markets, adequate transportation is of vital significance to Alaska. Though the Yukon is navigable for river boats to Whitehorse in Canada, a distance of 2200 miles, it is open only three months. The Kuskokwim is navigable for 650 miles, and ocean vessels may reach its mouth during four months. These two rivers, with their tributaries, provide about 5000 miles of navigable waters which serve their basins in a very meager way. The snow cover and the ice on rivers, lakes and bays favor overland travel in winter, but transportation by dog- or reindeer-drawn sledges is primitive at best and wholly inadequate for industrial progress. In 1923 there were 898 miles of railroad completed or under construction. Nearly five-eighths of the mileage is in the Government Railroad connecting Seward with Fairbanks along the Susitna and Nenana valleys. A branch line extends into the agricultural and coal lands of the Matanuska Valley. There are also about 400 miles of gravel-surfaced highway. A start, therefore, has been made to provide better transportation facilities. Far more are needed. That railroads or highways will yield a profit for many years to come is highly improbable.

Commerce.—The total commerce of Alaska is nearly $90,000,000 annually, more than three-fifths being exports; of these, nearly three-fifths are products of the fisheries, and nearly a third are copper and gold. Furs, lumber, marble, wood pulp, gypsum, leads and reindeer meat are

other principal products. Nearly all of the exports go to the United States, from which Alaska imports about $30,000,000 worth of merchandise.

ALASKA, SWEDEN, FINLAND

Alaska, Sweden, and Finland are in approximately the same latitudes. The first has a more favorable oceanic location, but the other two have access to far better markets. Sweden and Finland, respectively, have populations 107 and 60 times larger than Alaska. Their people are progressive, capable, sturdy, energetic, and cultured. Both countries have evolved high types of civilization. This has been accomplished in environments possessing unfavorable climate and poorly endowed with other natural resources. A statistical comparison of the known resources of Alaska, of Sweden, and of Finland is presented in Table XV. Sweden has the larger potential water power, and Finland the larger area of good timber, but Alaska surpasses both countries in all other resources except iron. The extent and quality of the Alaskan iron deposits have not been determined. Alaska's potential food resources, measured in agricultural lands, grazing lands, and fisheries, are far greater. The same is equally true of its metallic mineral reserves and of its power resources measured by fuels and water power combined. Fully three-fourths of Alaska has a climate superior to that of Finland and to much of Sweden. Both countries far excel Alaska in the present utilization of resources. This is strikingly true of the agricultural and grazing lands. Finland, with only a tenth of the arable land of Alaska, exports $8,000,000 worth of dairy products. A large

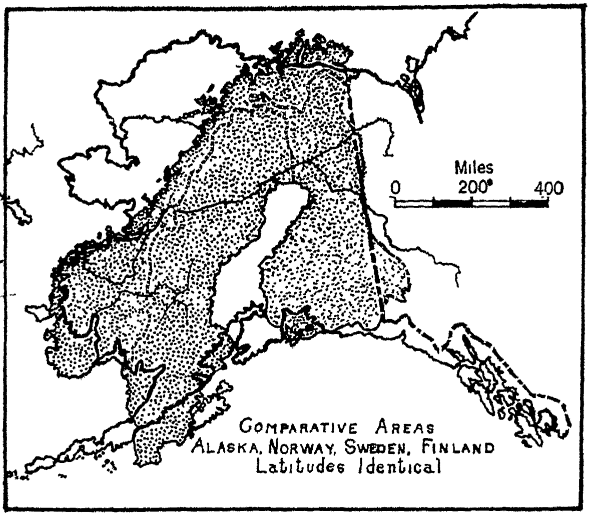


FIG. 224.

Alaska is larger than Norway, Sweden, and Finland combined. They are located in the same latitude. Is Alaska potentially equal to those three countries as a home for man?

TABLE XV

COMPARISON OF RESOURCES OF ALASKA, FINLAND, AND SWEDEN

Resource	Alaska	Finland	Sweden
Area, square miles	586,400	144,250	173,550
Agriculture			
Farming and grazing lands, square miles	94,000	9,500	24,300
Cultivated land, square miles	9	6,000	19,300
Agricultural population	1,000	1,000,000	2,800,000
Annual production, cereals, tons	(1919) 140	(1905) 776,000	(1910) 23,389,000
Annual production, potatoes and other root crops, tons	(1919) 1,200	(1905) 446,000	(1910) 50,238,000
Reindeer pasture, square miles	150,000	8,000	40,000
Forestry			
Total area of woodland, square miles	190,000	79,000	82,000
Areas of good timber, square miles	35,000	61,000	?
Minerals			
Placer gold reserves	$200,000,000+	None	None
Lode gold reserves	Very large	Very small	None
Copper reserves	Very large	Very small	Small
Iron reserves	Probably large	3,600,000 tons	442,000,000 tons
Platinum, tin, chromite, antimony, mercury, sulphur	Commercial deposits	None	None
Marble	Large deposits	None	Little
Sources of Power			
Total area of coal lands, square miles	2,000+	None	309
Probable petroleum reserves	Large	None	None
Total water power, H. P.	2,800,000	1,500,000	3,500,000
Total developed water power, H. P.	50,000	165,000	1,100,000
Fisheries			
Total export fish, 1913, tons	135,500	10,000	50,000
Communications			
Railroads, miles	765	1,900	7,000
Wagon roads, miles	1,030	27,240	38,380
Inland waterways, miles	6,000	3,240	900
Population			
Total	54,890	3,330,000	5,885,000
Per square mile	0.1−	23	34

* A. H. Brooks, The Value of Alaska. Geographical Review, Vol. XV (1925). p. 26.

proportion of its farms are relatively small, and the small farmer finds work during the winter months in forest industries. Most of Alaska's agricultural lands are in the interior, and the better forest areas are on the coast. Hence, if the Alaska farmer is to find work in the lumber camps during the long winters, he must travel considerable distances. If Finland can support 3,330,000 and Sweden 5,885,000 people, with natural resources inferior to those of Alaska, it seems reasonable to assume that Alaska may eventually maintain as many. Neverthless, the time when it will do so is far in the future. People will not undertake the hardships of pioneer life in Alaska until better markets and transportation facilities are provided. This will come with the development of industries other than agriculture. Alaska may therefore be looked upon as a reserve for the future, to be used when the better lands and other choice assets of the United States have been more fully taken.

PROBLEMS

1. Is Alaska as suitable as a home for man as the Rocky Mountain and Plateau States?
2. Can Alaskan meat production equal that of the Rocky Mountain and Plateau States?
3. Will the agricultural and live stock industries become the leading ones in Alaska?
4. Can Alaska maintain a population equal to that of California?
5. What three factors have been most important in retarding the development of Alaska?
6. What resource is likely to wield the greatest influence in the future development of Alaska?
7. When will Alaska be as densely settled as Norway?
8. How does Alaska compare with Scotland as a home for man?
9. Which geographic region of Alaska is likely to have the larger population in the future?

CHAPTER XXII

CANADA AND NEWFOUNDLAND: MAJOR FEATURES OF THE NATURAL ENVIRONMENT

CANADA occupies nearly all of that portion of North America lying north of the United States. Its southern extremity reaches 41° 41′ N., in southern Ontario, which corresponds with southern Italy. If we were to transfer the British Isles to central Canada, Lands End would rest at Winnipeg while the northern shores of Scotland would reach the mouth of the Churchill River.

Unlike most countries, Canada has three oceanic boundaries, but two are wholly or partly closed during a portion of the year. All of its provinces except two border on salt water. The Pacific and the Atlantic are its great natural outlets. On the east it has the estuary of the St. Lawrence; on the west the Prince Rupert and Vancouver entrances, and in Hudson Bay, Port Nelson, which is little used at the present time. Canada is a northern or high-latitude country with all the climatic limitations that such a location implies. Only a small part of its area lies south of latitude 50°; probably less than 800,000 square miles. It is across the narrower part of the narrowest ocean from the great markets of Europe, especially from the British markets with which it maintains preferential trade relations. It has a most favorable location in relation to the great markets of the United States, in which it can dispose of much of its surplus raw materials and from which it can purchase manufactured products and attract American investments. It is the shortest route from the Orient to Europe, by which small packages of high value may be shipped.

Canada is a vast country with many variations in climate and other resources. The land area is 3,654,000 square miles, and the water area is 142,900 square miles exclusive of Hudson, Ungava, and Fundy bays, the Gulf of St. Lawrence, and essentially all other tidal waters. In area, therefore, it is larger than the continental United States or the European mainland. At present its developed portion is only an attenuated area along the southern border, an hourglass-shaped region which is restricted at Winnipeg, through which all east and west traffic must pass. Economically and socially, it is essentially a northern exten-

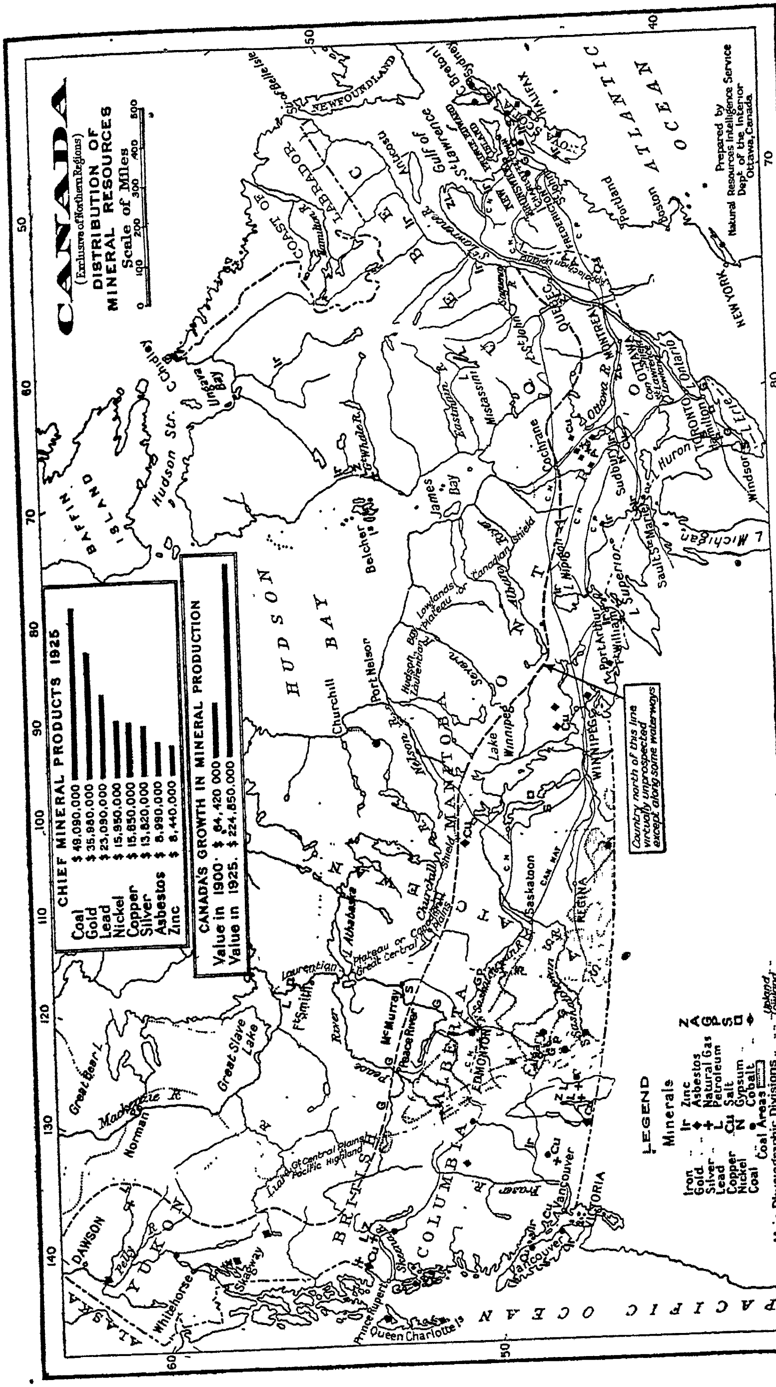


FIG. 225.—Distribution of Principal Minerals and of Railroads.

sion of the United States. The interchange of commercial products is not unlike that between the South and West and the industrial northeastern section of the United States. Under modern conditions the settled or developed portions of a country do not extend far from transportation lines; hence vast areas of Canada are very sparsely settled, and much has not been explored except along the streams. The future development of the Dominion depends to a large extent upon the expansion of its transportation system, especially its railroads. A part of our problem, therefore, in the study of Canada, is to ascertain *what resources are included* in this vast area, and *how the people have utilized them, and to discern some of the possibilities.*

TABLE XVI

LAND AND WATER AREA OF CANADA BY PROVINCES AND TERRITORIES AS OF 1925

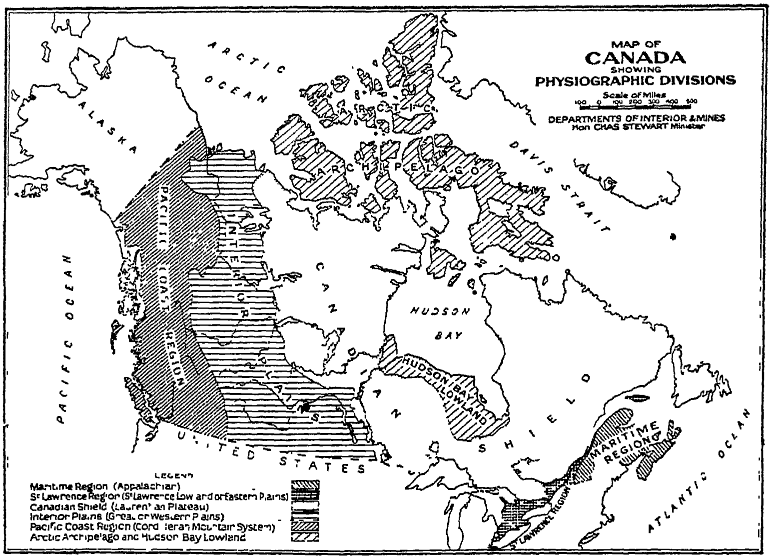
Provinces	Land, Square Miles	Water, Square Miles	Total Land and Water, Square Miles
Prince Edward Island	2,184	....	2,184
Nova Scotia	21,068	360	21,428
New Brunswick	27,911	74	27,985
Quebec	690,865	15,969	706,834
Ontario	365,880	41,382	407,262
Manitoba	231,926	19,906	251,832
Saskatchewan	243,381	8,319	251,700
Alberta	252,925	2,360	255,285
British Columbia	353,416	2,439	355,855
Yukon	206,427	649	207,076
Northwest Territories:			
Franklin	546,532	7,500	554,032
Keewatin	218,460	9,700	228,160
Mackenzie	493,225	34,265	527,490
Total	3,654,200	142,923	3,797,123

PHYSIOGRAPHIC REGIONS AND CLIMATE

The surface features of Canada are primarily a northward extension of similar features in the United States, particularly the lofty mountain mass in the west, the mountainous section in the east, and the central plains. On the basis of surface and structure, Canadians have divided their country into five major physiographic regions: the Appalachian Region, the Canadian Shield, the St. Lawrence Lowland, the Interior

Continental Plain, and the Pacific Coast.[1] These regions should not be confused with present regions of human use discussed in subsequent chapters. Human-use regions are not coextensive with physiographic regions.[2]

Appalachian Region.—The Appalachian Region has an area of approximately 80,000 square miles. It includes the Maritime Provinces, that part of Quebec on the southeast side of the St. Lawrence River, and Newfoundland. Its surface is mountain-like in character; but when compared with the Cordillera on the west it would be described as hilly.



Courtesy Canadian Departments of Interior and Mines.

FIG. 226.—The Major Physiographic Regions of Canada.

The rocks are made up chiefly of sedimentary and igneous strata which were laid down from pre-Cambrian times onward, then folded, faulted, and invaded by igneous rocks. Though settled at an early date, much of this area has not been thoroughly examined for mineral resources. Of the minerals, coal is of first importance, occurring in Nova Scotia and New Brunswick. It is estimated that the former has a probable reserve of 9,700,000,000 tons, and the latter 150,000,000. Asbestos is the sec-

[1] Some writers distinguish "Arctic Archipelago and Hudson Bay Lowland" as an additional region. (Fig. 226.)

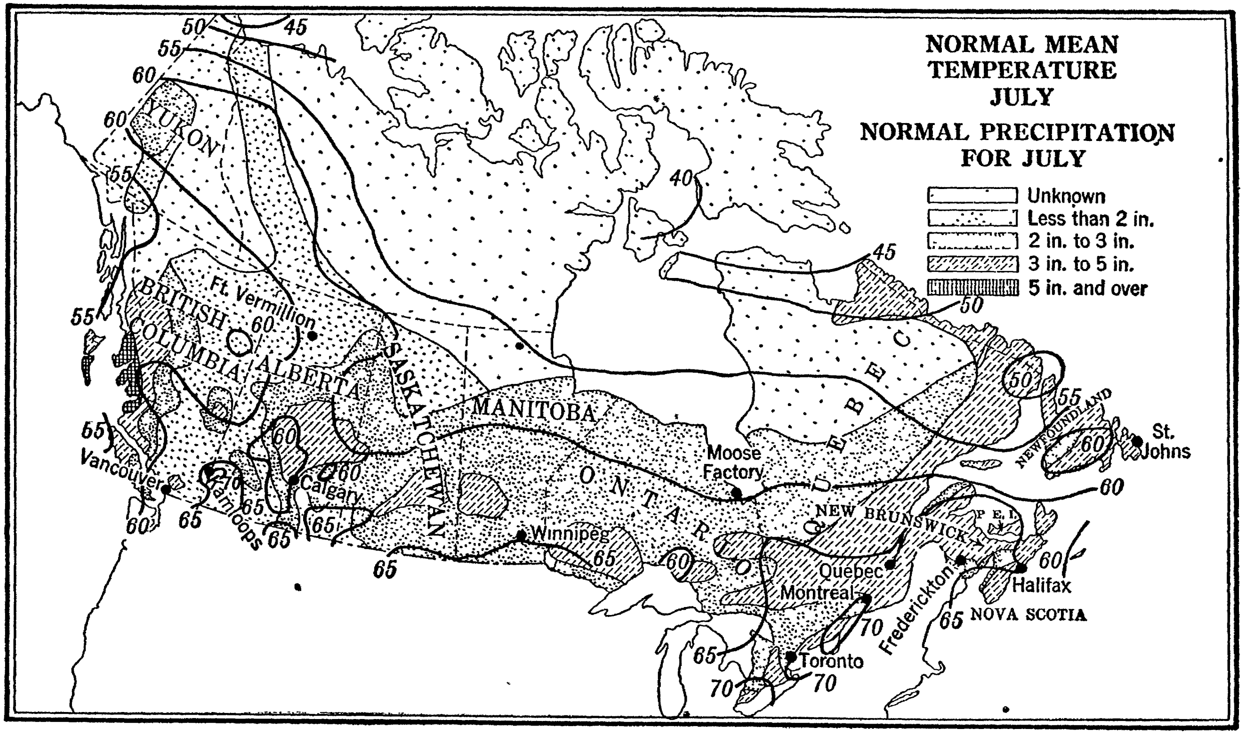
[2] Only a general view of the physical environment of Canada as a whole is presented here. Detail applicable to human-use regions is presented in the discussion of those regions even though apparent repetition occurs.

ond mineral in importance and occurs in the vicinity of Thetford and Black Lake in southeastern Quebec, where, from a few square miles, is obtained most of the world's supply.

The region is well drained by numerous small streams, the rapids and waterfalls of which offer power possibilities. Owing to the character of its surface, its soil areas suitable for agricultural purposes are limited, although many sections are to-day producing crops and still other areas are capable of agricultural utilization. Except for certain striking differences, the climate is similar to that of southern Ontario. Springs are later near the sea, and summers are a little cooler. Summer temperatures of 85° and even 95°, and sub-zero winter temperatures are not uncommon. October is a month of severe frosts. In Nova Scotia the winters are slightly warmer than in southern Ontario, but in New Brunswick they are colder and are comparable to those of western Quebec. Precipitation is abundant, being slightly greater in the fall and winter half of the year, and exceeds 50 inches on the south shore of Nova Scotia, though 40–45 inches is more general. The snowfall in northern New Brunswick is very heavy, exceeding 100 inches.

Canadian Shield.—The Canadian Shield, or Laurentian Plateau, occupies approximately, 1,800,000 square miles about Hudson Bay. It is roughly triangular in outline with the apex south of Lake Superior in the United States, and the base on the Arctic Ocean. The western boundary extends southward from the Arctic Ocean along the line of lakes from Great Bear, Great Slave, Athabaska, and Winnipeg, to Lake of the Woods, where it crosses into United States territory. The southern boundary extends from the southeastern part of Georgian Bay to the vicinity of Quebec, and includes the Labrador Peninsula.

This vast region is known only partially even along its southern boundary. Much of its interior has not been explored except along the streams. It is made up largely of granite, gneiss, limestones, and slates. Geologically, its rocks are among the oldest forming the land surface of North America. Portions of its area are barren rock surfaces, but in most places there is sufficient soil in the various depressions or crevices to sustain forest cover. South of James Bay is a large area known as the Clay Belt, covering part of the bed of an old glacial lake, which is thought to have agricultural possibilities. The Shield as a whole was largely stripped of its soil by the glacier and other erosive agents. Here and there are local areas suitable for farm land. The region, in general, is of moderate relief broken by river valleys, by lake basins, or by occasional rocky hills that rise above the general level. Nowhere, except in northern Labrador, does it exceed 2000 feet in elevation and in most places it is less than 1000 feet above sea level. In general it



Courtesy Dominion Meteorological Service.

FIG. 227.—Distribution of July Precipitation and Temperature.

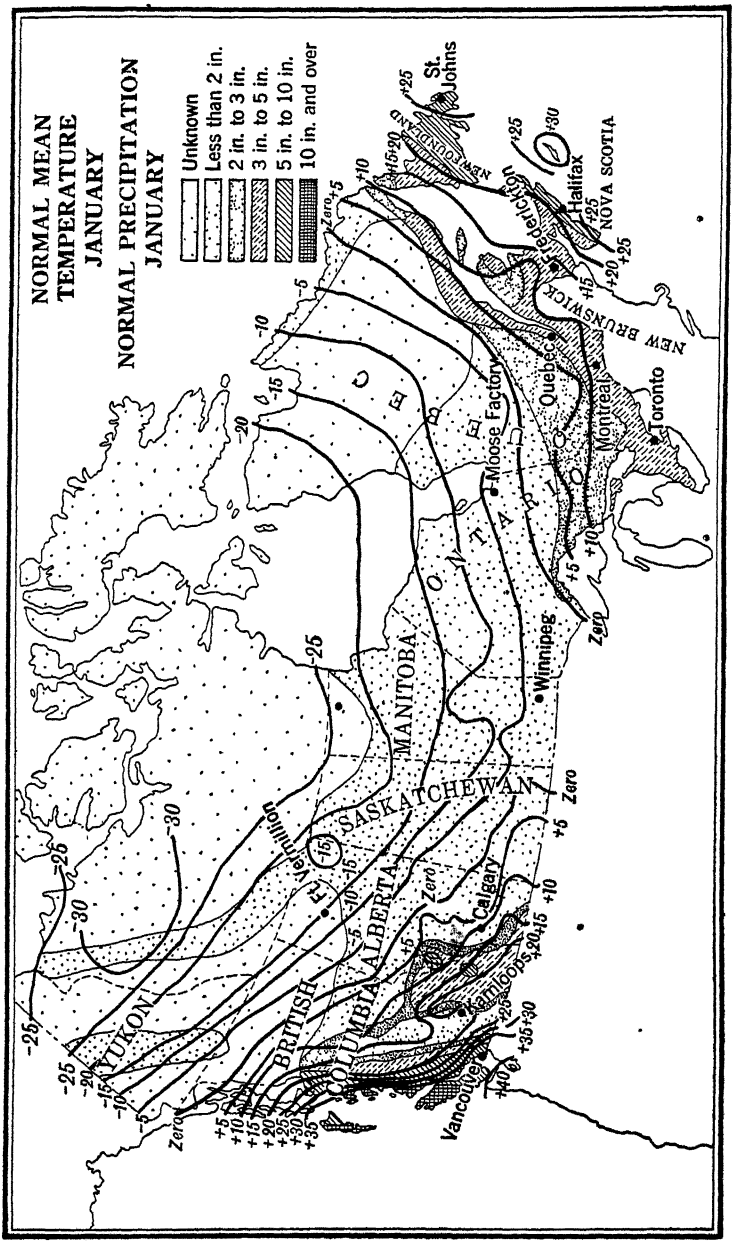
Compare with Figs. 228 and 229.

resembles a plain-like country depressed toward the north and in the center, and elevated slightly along the southern and eastern borders. Portions are true plains, and other parts are somewhat rugged but not comparable to a mountainous country. Most of its streams flow into Hudson Bay, while others flow to the Great Lakes and Atlantic outlets. Thousands of lakes dot its surface

Over such a large extent of territory, variation in climate, minerals, plant life, and other resources is to be expected. The southern portion is known to be rich in minerals, and it is highly probable that mineral deposits of economic value may be discovered throughout the area. Nickel, copper, gold, silver, mica, and graphite are among the important minerals now utilized. The nickel and silver fields of Cobalt and Sudbury produce about 90 per cent of the value of all minerals obtained from the Canadian Shield, and if gold and copper are included the percentage is 95. Much of the area is forested, and the forests of the southern part are of high commercial value.

No meteorological stations exist in most of the area lying north of the St. Lawrence Lowland and the agricultural area of the Prairie Plains. Over the vast area of northern Canada, the climate is the sub-arctic type (Fig. 229) except for local variations, e.g., in the Mackenzie River Valley the summers are warm, and wheat has been matured north of the Arctic Circle. It is probable that similar mild conditions prevail over the region lying between the Mackenzie and the Rocky Mountains. On the whole, the winters are cold, and it is May before there is much growth. Frosts begin in September, and the winter begins in October. Summer rain is scant, and snowfall is light over the entire area. The climate of the north and east shores of lakes Superior and Huron and of Hudson Bay is modified by these water bodies. The region of the former is swept in winter by cold waves of great severity which pass unchecked over the region from the far northwest. The winters are very cold with heavy snowfall, while the summers are generally warm, temperatures of 90° being recorded during the heat spells. Over much of the region, however, the margin of temperature safety is small, and frosts may occur during the summer months.

St. Lawrence Lowland.—The St. Lawrence Lowland lies between the Appalachian Region on the east and the Canadian Shield. It is the smallest of the physiographic regions, having an area of about 35,000 square miles. This region is a series of plains areas in Quebec and Ontario, extending west from the city of Quebec along the St. Lawrence Valley, and including the triangular portion of Ontario lying between Georgian Bay and lakes Erie and Ontario. It may be subdivided into three sections: (1) the Ontario peninsula with a steep escarpment of



Courtesy Dominion Meteorological Service.

FIG. 228.—Distribution of January Precipitation and Temperature.

Compare with Figs 227 and 229.

limestone on its eastern border, (2) the Eastern Ontario basin, separated from the (3) St. Lawrence River plain by a point of crystalline rocks. It has a great variety of fertile soil, which offers excellent agricultural opportunities, and is the region in which most of the people of Canada live. So far as is known, it has no metals or coal, but it has gypsum, petroleum, natural gas, salt, and clay suitable for the manufacture of structural materials.

In the peninsular portion of Ontario, April is a true spring month. Frosts are rare in May, and the trees are usually in full leaf by the end of that month. The mean temperatures are slightly above 70° in July, and only slightly lower in June and August. (Fig. 227.) The tempering effects of the Great Lakes are evident in this section. Abundant sunshine and rainfall coming in showers prevail during the summer, while the winter monthly precipitation is about the same as that of the summer months. The autumn may begin in the latter part of September, but it is generally October before severe frosts prevail. Northward into the Ottawa Valley spring comes later than in the south, and autumn comes earlier. However, the summer temperatures and rainfall are much the same while the winter temperatures are much lower. Here the ground is covered with snow earlier than in the south, which is an important factor in lumbering operations.

At Montreal, farther east along the St. Lawrence in southern Quebec, March is a winter month, although April and May are as warm as in Toronto, and in midwinter Montreal is slightly warmer. The autumn is similar to that of southwestern Ontario, and is followed by a rapid fall of temperature in winter and a normal temperature 10° lower than Toronto. There is usually 1–3 inches of snow cover during a period of four months. Farther eastward in the St. Lawrence Valley, the summers are cooler, and the winters colder, with late springs. May is the spring month, and mid-September the beginning of fall. Throughout this area the precipitation is nearly uniform during the year.

Interior Plains Region.—The Interior Plains extend from the Canadian Shield westward to the mountains and northward from the United States boundary to the Arctic, including an area of approximately 500,000 square miles. They embrace parts of Manitoba, Saskatchewan, British Columbia, the Northwest Territories, and nearly all of Alberta. The region as a whole has a nearly continuous soil cover of glacial, fluviatile, and lacustrine deposits which vary in thickness from a few feet to several hundred. Only on steep slopes or in the large stream beds is the underlying bed rock exposed. It is a relatively flat country, increasing in altitude westward by a series of escarpments which divide the plains into three prairie levels. The first prairie level

has an elevation of about 800 feet, and includes the almost flat Red River Valley, once the bed of Lake Agassiz. Its western border is a series of hills rising from 500 to 1000 feet and known as the Manitoba escarpment. These hills extend northwestward about 300 miles from the middle of the southern boundary of Manitoba and parallel with lakes Manitoba and Winnipegosis. The second prairie level has an average elevation of 1600 feet and a gently undulating surface, and extends westward some 250 miles to the Missouri Coteau or second escarpment. This escarpment, or series of hills, rises 200–500 feet, is nearly parallel with the first, and extends diagonally across Saskatchewan from near its southeast corner into Alberta. The third prairie level,

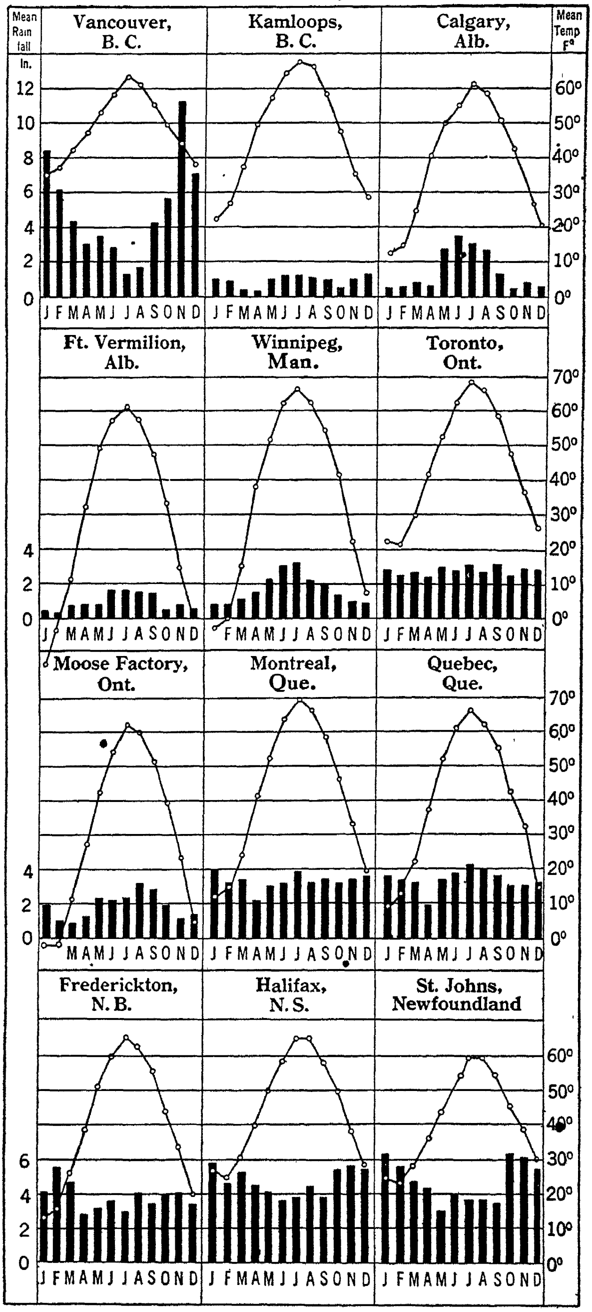


FIG. 229.—Mean Monthly Precipitation and Temperature at Twelve Stations.

Describe the precipitation and temperature characteristics in each section of the Dominion. Compare with Figs. 227 and 228.

in all the other Prairie Provinces. Frosts may occur during early June and the latter half of August. The average annual rainfall is 14–18 inches, 60 per cent of which comes during the growing season from May to August. There are 30–36 inches of snow in the west and south, and 40–50 inches in the east and north.

In southern Alberta, which corresponds roughly with the third prairie level, the winter climate is highly variable. The normal winter is cold. The extreme cold prevails from November to March in some years, while in other years the winter is warm and sunshiny, on account of the constancy of the Chinook. This variation is shown strikingly by a series of temperature changes at Calgary: the mean in November for one year was 39°, and for another year 2°; in January the mean one year was −6° and the following year it was 26°. April is a true spring month, and by that time seeding is well along or may be completed. The temperature increases rapidly during May and June, reaching the maximum in July and August, which are hot months. The heaviest rainfall occurs from the middle of May to the end of July, and is about the same as that of southern Ontario and Quebec during the same period. The margin of safety, however, is small, hence a slight decrease below normal may seriously decrease crop yield.

The climate of this region has two striking features: (1) The summer isotherms run nearly north and south with a mean temperature nearly as high in the extreme north as in the south, and the long summer days of the north result in a very rapid growth of plant life. (2) The Chinook winds, which usually occur with strong west and southwest winds, are most frequent in the south, but occur frequently in the Peace River country in the north. The arrival of this wind may bring a temperature change from −20° to 40° in a few hours. Under its influence the grasslands are usually free from snow during the winter months, making grazing possible.

Pacific Coast Region.—The Pacific Coast or Cordilleran Region extends from the Interior Plains to the Pacific Ocean, and includes nearly all of British Columbia and Yukon Territory and part of Alberta and of Northwest Territories. It has an average width of about 400 miles and extends nearly 1500 miles north and south, containing approximately 650,000 square miles. It is a region of lofty, rugged mountain systems with limited agricultural lands in the valleys. On the east are the Rocky Mountains, and on the west the Coast Range with a small central plateau which is broken by numerous smaller ranges. Just west of the Rockies is a valley known as the Rocky Mountain Trench, extending in a northwest-southeast direction for about 700 miles and containing parts of the courses of the Columbia, Fraser, and Kootenay rivers,

and two tributaries of the Liard and two of the Peace rivers. West of the Coast Range is a partially submerged mountain mass, appearing in Vancouver and Queen Charlotte Islands, which is probably a continuation of the Coast Range of the United States. Owing to the rugged character and few passes, the mountains form a barrier between the coast and the interior, which has now been only partially overcome by the construction of railroads. The Pacific Coast Region differs from the western highland section of the United States in a number of striking ways. It is only about one-half as wide, with less interior plateau, with no enclosed drainage basin, and with no truly arid area. It forms about one-sixth of Canada, compared with one-third of the United States; and is mainly forested. Many streams drain the area to the Pacific, Arctic, and Hudson basins. In the south, these streams follow the parallel valleys between the mountain masses but make sharp turns, cutting through the mountains in deep canyons with many rapids and falls, making water power available in large amounts. Many long, narrow lakes, the product of glacial erosion and deposition, occur in the valleys and along the water courses. The coast is of the fiord type and is estimated to be 7000 miles long.

The region is rich in mineral resources. Coal deposits occur throughout its length, and gold, silver, copper, lead, and zinc are abundant. The great placer gold fields of the Klondike are well known.

The prevailing westerlies bring to the coast of this region the modifying influence of the ocean. The climate varies strikingly with altitude and distance from the sea. (Figs. 227, 228.) Along the coast the rainfall exceeds 100 inches, but is less than half that amount only a comparatively short distance east. The dry period occurs from May to September, and the period of heavy rain from September to March when the warm oceanic winds are blowing on cool lands of high altitude. Severe frosts rarely occur at the lower levels. These levels, west of the Selkirks, have a mild climate, where spring arrives early, and frost rarely occurs later than April, while March is distinctly a spring month. The summers are warm and the winters usually mild and rainy, especially near the coast. About 70 miles inland at Agassiz, the average January temperature is 35°, and the July average 64°, while −13° and 103° are recorded extremes. The average annual rainfall is 67 inches, two-thirds of which falls from October to March inclusive. (Fig. 229.)

East of the Coast Range, marked climatic changes occur. The westerlies leave most of their moisture on the west side of the mountains and in descending become warm and evaporating winds, hence the plateau between the Coast and the Selkirk ranges is dry. The summers are warm and the winters colder than on the coastal lowlands. The colder

CHAPTER XXIII

THE CANADIAN PEOPLE AND THEIR PRINCIPAL INDUSTRIES

THE PEOPLE OF CANADA

Distribution and Growth of Population.—Examination of the population map of Canada reveals a land of large area and few people. Vast stretches of country are almost uninhabited. The concentration of its 8,788,483 people along the southern border emphasizes the attenuated character of the country. If the southern boundary were moved 150 miles north, Canada would lose nearly all of its people. The reason for this is understood when one considers the climate, soil, and surface. Three-fifths of the total population is in Quebec and Ontario, nearly all being in the St. Lawrence Lowlands. Here are located all, except two, of Canada's cities of more than 100,000 population; three-fifths of those with 10,000 or more; and the only cities—Montreal and Toronto—that exceed half a million. This is also the dominating manufacturing, commercial, and financial section of Canada. (Fig. 231.)

The urban and rural population of Canada is nearly balanced, as 49.5 per cent of the people live in cities and incorporated villages, an increase of 17.7 per cent in thirty years. During the last census decade, urban communities absorbed approximately two-thirds of the total population increase of Canada. These figures, however, are not comparable to those of the United States, where towns of less than 2500 are counted as rural. Considering places of 5000 and more—the lowest comparable figures available—36.5 per cent of the population of Canada and 47 per cent of that of the United States are urban. These figures probably represent more truly the relation of urban and rural population in Canada from the viewpoint of human interest, as on this basis Quebec and Ontario are the only provinces in which the urban population exceeds the rural.

The growth of Canada's population has been slow compared with that of the United States. Only during the last two census periods has the increase reached or exceeded a million. There is a tendency for the population to shift from the east to the west, as in the United States. During the last census decade (1911–21), the population of the four

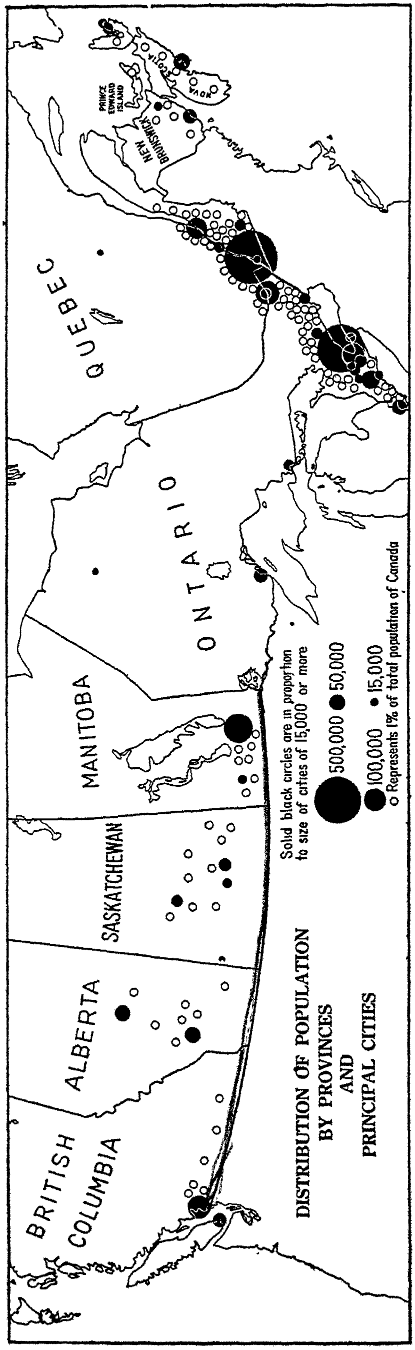


FIG. 231.

Approximately three-fifths of the population of Canada is in the St. Lawrence Lowland Region This region contains all except two of the large cities. Why is there such a sparse population north of the Great Lakes?

western provinces increased 44.2 per cent, and that of the five eastern provinces 15 per cent, though the absolute increase in the eastern provinces was considerably greater than in the western. Five decades ago (1871), 2.9 per cent were living in that region. During the same periods the Maritime Provinces have decreased relatively from 20.8 per cent to 11.3 per cent of the total population.

Composition.—The population of Canada presents a striking homogeneity in contrast with the heterogeneity of stocks in the United States. British stock makes up 55.4 per cent of the present population, nearly 29 per cent being English. About 28 per cent of the total are French. It will be seen, therefore, that four-fifths of the people belong to two human stocks. The remaining one-fifth is divided among seventy other human stocks. The same two stocks made up 86.5 per cent of the increase during the last census period. More than seven-tenths of the French are in Quebec where they constitute four-fifths of the total population. The English are much more widely

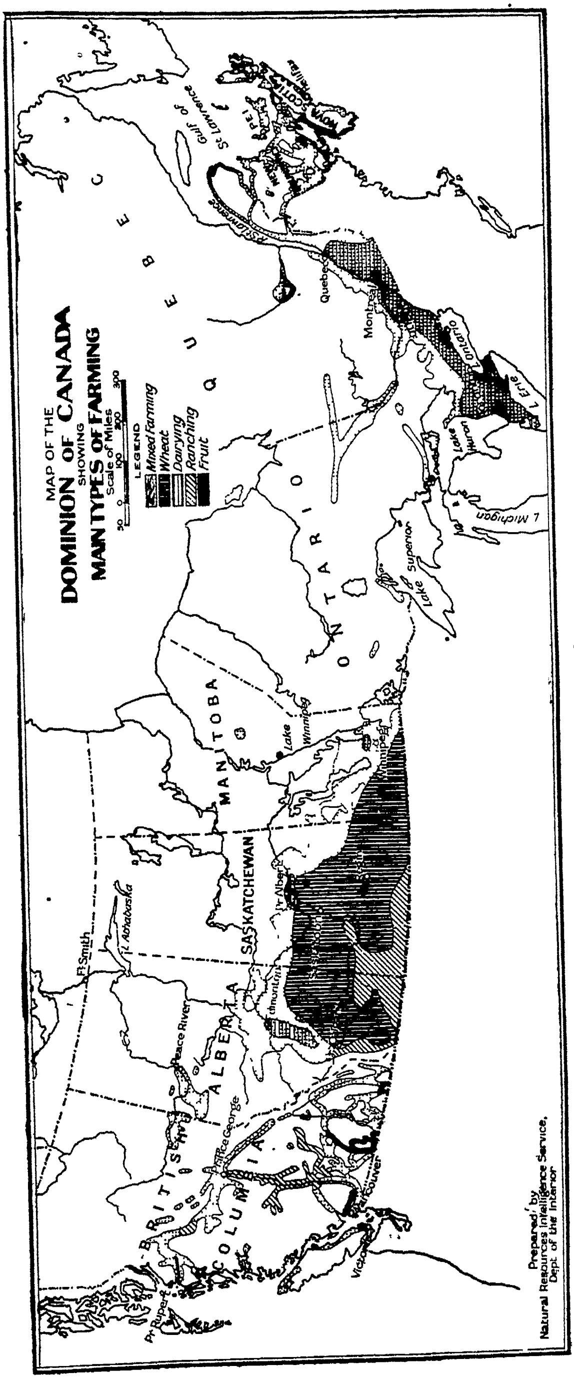


FIG. 232.

The East is predominantly a land of mixed farming and dairying, and the West a land of grain growing, especially wheat, and of ranching.

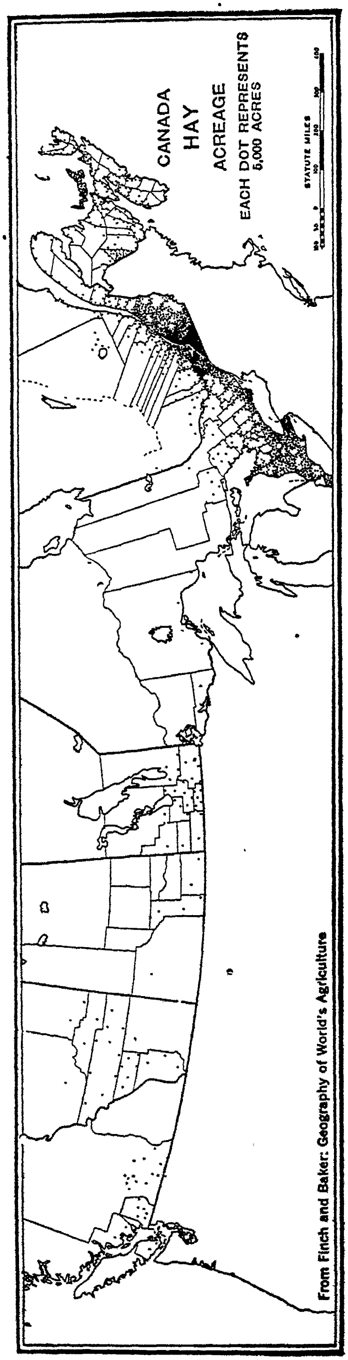


FIG. 233.

This map shows tame hay acreage only. In the eastern region of large production the crop is chiefly timothy and clover. The western provinces produce a large amount of wild and prairie hay in addition to the cultivated grasses.

scattered throughout Canada, yet more than two-fifths are in Ontario where they compose a like proportion of the total population of that province.

FOOD PRODUCTION

Agriculture.—Agriculture is Canada's most important industry, yielding an annual gross revenue of more than one billion dollars and giving employment to nearly half of the total population. It is limited almost entirely to the southern border, where there are large areas of virgin, fertile soil, with favorable climatic conditions for hardy grains and fruits, hay and forage, and root crops. The crop acreage of Saskatchewan is larger than that of any other province, and is followed by that of Alberta, Ontario, Manitoba, and Quebec. Though Saskatchewan ranks first in gross agricultural revenue, the combined revenue of Ontario and Quebec forms nearly half the total of Canada. The crop maps emphasize the fact that agriculture is confined to two major regions, viz., the St. Lawrence Lowland and the Prairie Plains. Two minor agricultural sections are the Maritime Provinces and the Pacific Mountain Region. The leading crops of Canada are shown in Fig. 236. Wheat and oats are by far the most important crops, followed by hay and forage,

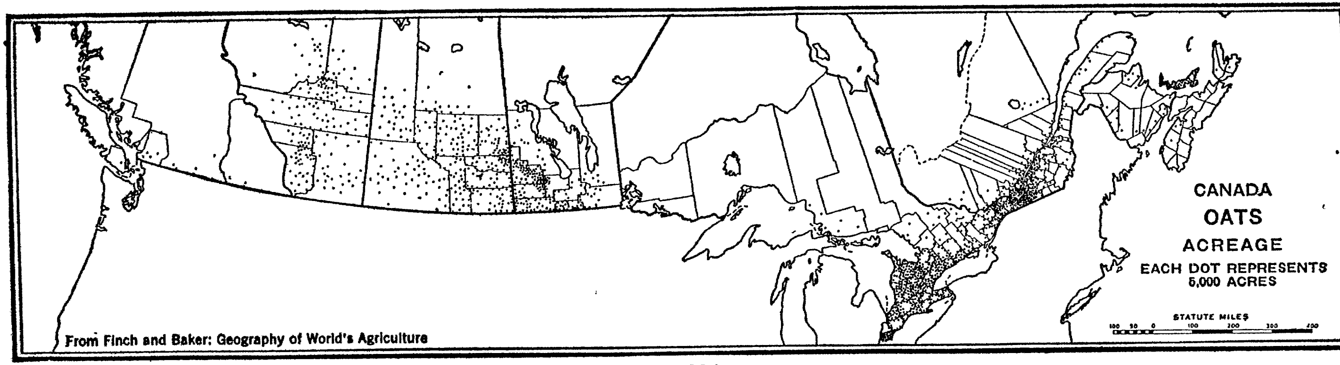


FIG. 234.

The oats acreage ranks next to that of hay and forage in the St. Lawrence Lowland, and next to that of wheat in the Prairie Plains.

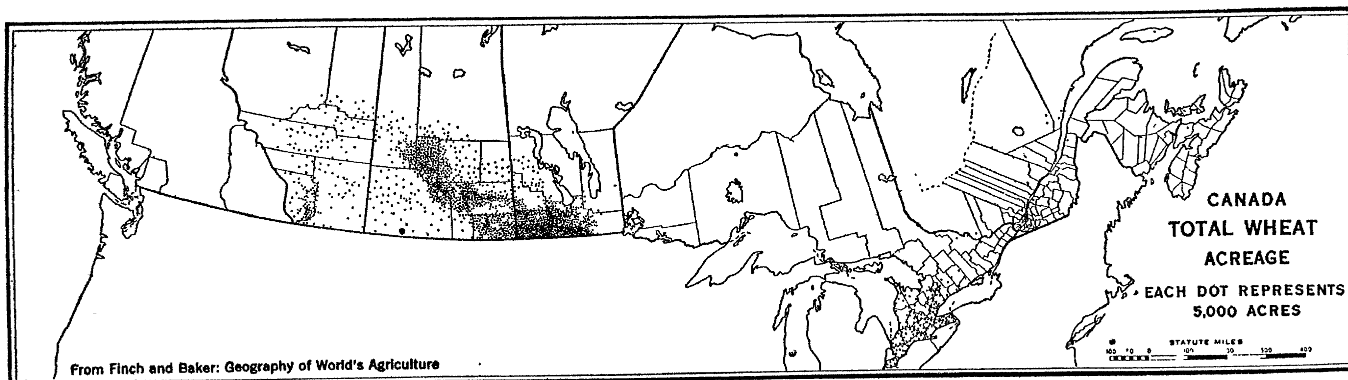


FIG. 235.

About four-fifths of the wheat acreage of Alberta, and practically all that of Manitoba and Saskatchewan, is spring wheat. Nearly all the winter wheat is grown in southeastern Ontario, and on the high plains of Alberta

barley, mixed grains, rye, etc., measured in terms of acreage. Hay and forage (both cultivated and wild hay) form a very important Canadian crop, exceeding all others, except wheat, in value.

Live Stock.—The principal live stock raised on Canadian farms are cattle, hogs, sheep, and poultry. The total number is small when compared with the number of live stock in the United States, but compares favorably with any one of several states. The distribution of these animals is shown by the maps. As cattle are raised on nearly every farm, their distribution corresponds fairly closely with the agricultural area. Most of them, however, are confined to the St. Lawrence Lowland, the adjoining margin of the Canadian Shield, and the Prairie Plains. Dairying is not yet developed extensively, but has made rapid progress in recent years. Butter and cheese are the leading products of the dairy factories, the former equaling $60,000,000, and the latter nearly $30,000,000. The total value of home-made and factory-made dairy products is estimated to be in excess of $250,000,000. (Study Figs. 232–240.)

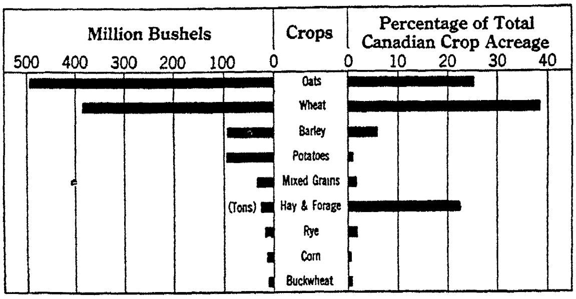


Fig. 236.—Principal Crops of Canada. Average, 1923–1925.

Wheat, oats, and hay and forage occupy more than 86 per cent of the crop acreage of Canada.

Surplus Produced.—Canada now produces a surplus of a number of food products. This is especially true of grain and animal products. Figure 240 shows an average net grain export of nearly $280,000,000 and nearly $70,000,000 worth of flour and mill products. Wheat flour constitutes the largest item in the last-named group. Dairy products stand first among the animal products, followed by meats and live animals. This indicates that the people of Canada are producing annually considerably more than is needed for their own consumption, and raises the question of present and future land utilization.

Agricultural Area.—Only a small portion of the land area of Canada is now used for crop production. The crop acreage is less than one-fifth of the potential agricultural land, though it has made a substantial gain in recent years. The total acreage occupied as farm lands is approximately one-tenth of the total area of the nine organized provinces.

It is not possible to state the potential agricultural area with any

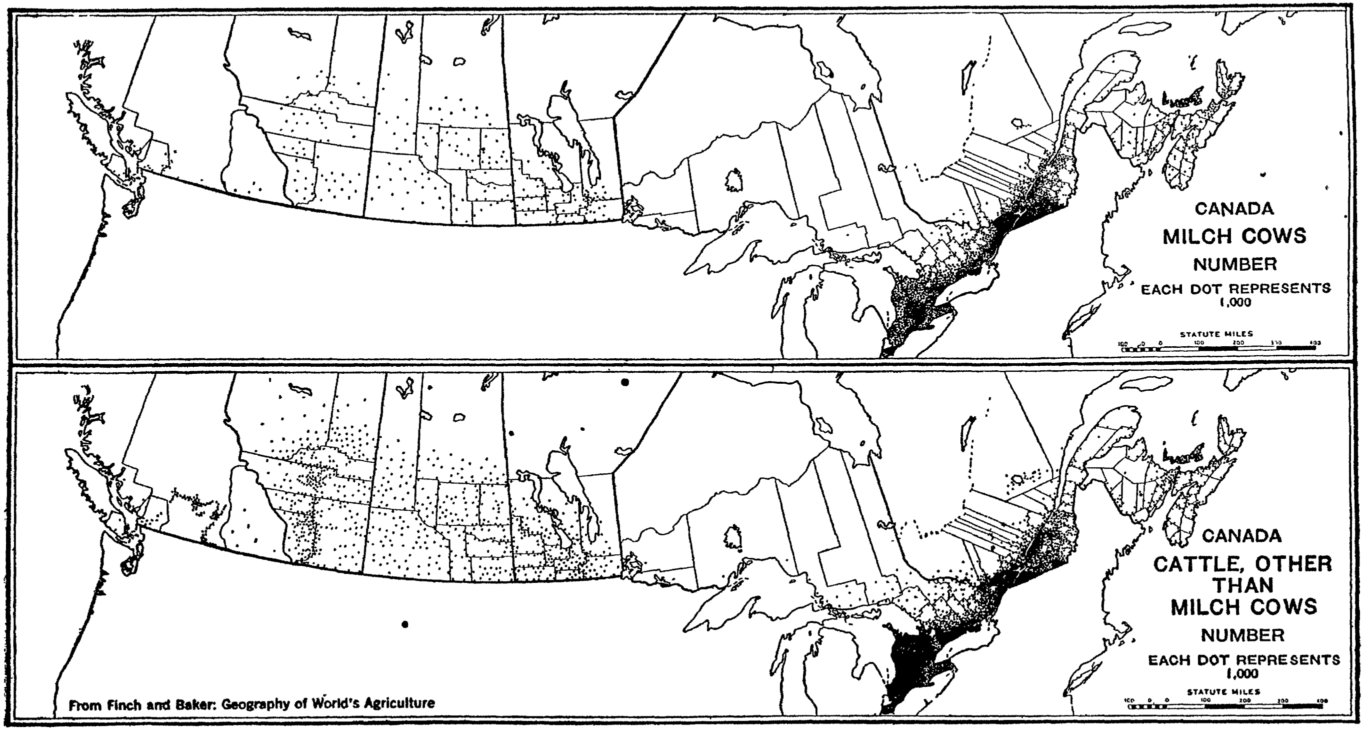


FIG. 237.

The importance of dairying in the St. Lawrence Lowland Region is shown by the large number of dairy cattle. In the Prairie Plains Region cows are maintained chiefly for breeding stock. The comparatively large number of cattle, other than cows, in southern Alberta and peninsular Ontario reflects the use of winter-grazing lands in the former, and of corn in the latter. Half the cattle of Canada are in Ontario and Quebec.

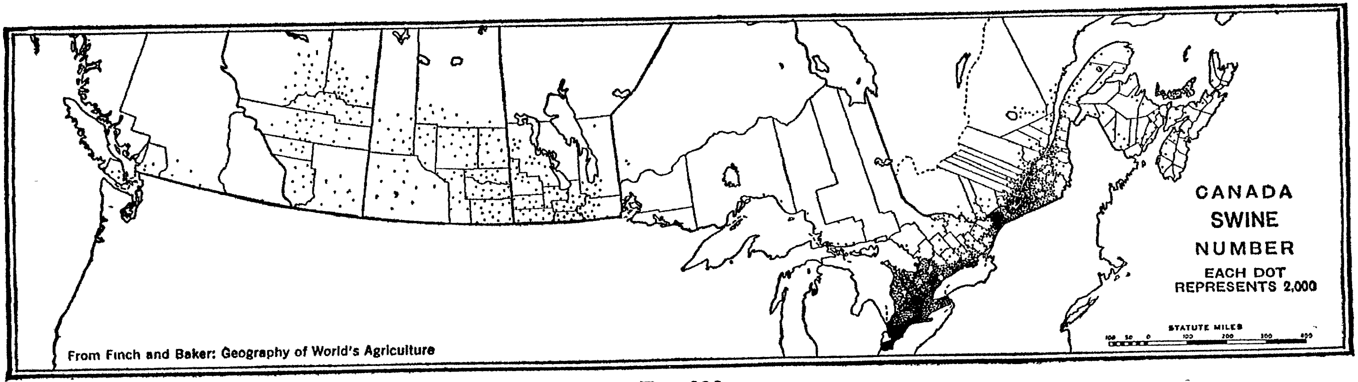


FIG. 238.

Though swine are raised in nearly all settled portions of Canada they are most numerous in the St. Lawrence Lowland Region, where the corn and oat crops are important, and the dairy industry well developed.

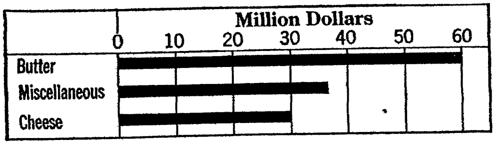


FIG. 239.—Factory Dairy-products of Canada. Average, 1923–1925.

Dairying has become a well established industry. In which region of Canada is it most important?

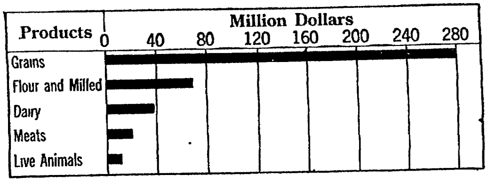


FIG. 240.—Surplus Agricultural Food Products. Net Exports, Average, 1923–1925.

Canada produces a large surplus of agricultural products, particularly grain and grain products.

great degree of accuracy. Nevertheless, available figures are sufficiently accurate to show large agricultural possibilities, and to assure a food-producing capacity sufficient for the maintenance of a much larger population. Canada has an estimated arable area of approximately 300,000,000 acres or about a fifth of the total area, exclusive of the Northwest and Yukon Territories, which have little or no crop value, or which are not likely to be used for crop production until the more desirable land elsewhere is utilized. The arable acreage varies from 9 per cent of Quebec and British Columbia to 85 per cent of Prince Edward Island, while the present acreage of field crops is only 4 per cent of the land area and 19 per cent of the arable area of Canada. The distribution by provinces is shown in Table XVIII. Nearly half of the arable land is in Saskatchewan and Alberta, and a third in Quebec and Ontario.

TABLE XVIII

CROP ACREAGE AND ARABLE LAND

	Total Land, Acres, 000 Omitted	Crop Acreage,* Field Crops		Arable Land		
		Acres, 000 Omitted	Per Cent of Land Area	Estimated, Acres, 000 Omitted	Per Cent of Canada's Total Arable	Per Cent of Land Area
Quebec.	442,153	6,738	1 5	40,000	13 3	9 0
Ontario	234,163	10,308	4 4	55,000	13 8	23 4
British Columbia	226,186	395	.1	20,000	6.7	8.8
Alberta	161,872	10,755	6 6	74,000	24.7	45.7
Saskatchewan	155,764	20,388	13 0	70,000	23 3	44 9
Manitoba	148,432	6,825	4 5	25,000	8.3	16 9
New Brunswick	17,863	889	4.9	10,000	3 3	55 9
Nova Scotia	13,483	690	5 1	5,000	1.7	37 0
Prince Edward Island	1,397	519	37 1	1,200	0 4	85.0
Total	1,401,313	57,507	4.1	300,200	100 0	21.4

* 3-year average.

FOREST INDUSTRIES

Forest Products.—The forest resources are among the greatest held by any country in the world. Forest products rank next to those of agriculture in value. Lumber, lath, shingles, and pulp are the most important products, constituting about four-fifths of the total value, the first group being nearly a fifth more valuable than the pulp. Other leading products are firewood, ties, cooperage stock, and squared timber

and logs for export. British Columbia leads in lumber products, followed by Ontario and Quebec, the three producing more than four-fifths of the total. New Brunswick and Nova Scotia are the next in order as lumber producers. (Figs. 241–243.)

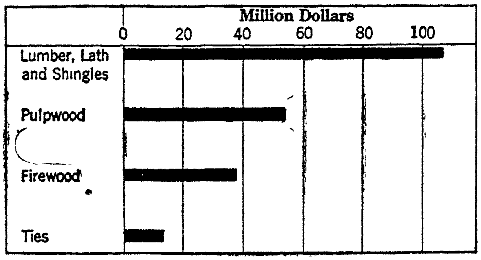


Fig. 241.—Principal Forest Products of Canada. Average, 1921–1923.

Lumber, lath and shingles are the principal forest products, as their value is more than twice that of pulpwood, which ranks second.

The rise of wood-pulp and paper manufacture to the rank of a major industry is relatively recent. The first pulp mill is said to have been erected in 1870. Ten years later, five pulp mills were in operation, and twenty-four in 1891. Since then the industry has experienced a rapid growth. At present, 115 mills are engaged in the production of pulp and paper. This development is due primarily to the coexistence of abundant water power and great resources of the species of trees best adapted to present processes of pulp manufacture. Probably only slightly less important is the proximity of excellent markets in the United States. Pulp wood, which is now second in rank among the primary forest products, is produced from spruce, balsam fir, hemlock, poplar, and Jack pine, seven-tenths being derived from spruce. Ontario and Quebec lead in wood-pulp production.

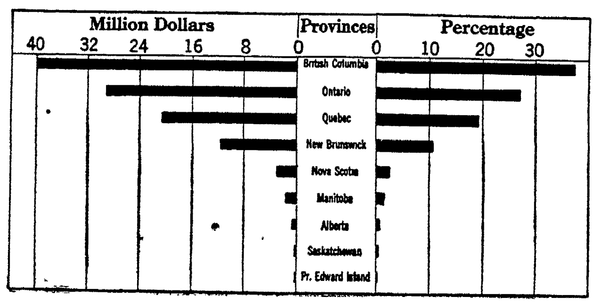


Fig. 242.—Production of Lumber, Lath, and Shingles by Provinces. Average, 1921–1923.

Measured by value, British Columbia and Ontario together produce three-fifths of the lumber, lath and shingles of the Dominion.

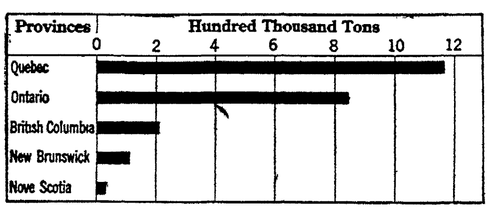


Fig. 243.—Production of Wood Pulp and Paper by Provinces. Average, 1921–1923.

Quebec and Ontario together produce more than three-fourths of the pulpwood of Canada.

yielding 85 per cent of the total output. Paper-making industries are growing, especially in these two provinces, nearly three-fourths of the total product-value at the present time being newsprint. British Columbia is the only other paper-making province, and its production is small compared with that of Ontario and Quebec.

Surplus Produced.—With the vast forest resources, one would expect the people to produce more than was needed for home consumption. The exports of pulp and paper rank next to the exports of agricultural products. The United States and the United Kingdom are the principal markets for wood pulp and paper, nearly four-fifths of the exports going to the former. In addition, the United States receives annually more than $15,000,000 worth of pulp wood. About two-thirds of the newsprint paper consumed in the United States yearly is either manufactured in Canada or is made from imported Canadian pulp wood. Owing to the depleted condition of the former's forests, it may be considered as not only the greatest present market, but also a permanent one for Canada. As the vast forest resources of Canada have scarcely been touched at present, they may be expected to make a large contribution to the economic welfare of the Canadian people. These people are profiting by the failure of the United States to conserve its forests by initiating and executing intelligent forest-conservation regulations.

MINERALS

Distribution.—Scattered over the large area of Canada, minerals occur in great variety. The ones that may be considered critical in the development of modern nations, viz., coal and iron, are unfavorably distributed as they are on or near the Pacific and Atlantic margins of the country. So far as a survey of mineral resources is concerned, only the southern portion of Canada is known, and that only partially. Minerals are known to exist in isolated places over the vast stretch of northern Canada, but little more is known about them. Minerals were among the first of Canada's resources to be recognized as of importance. Iron, silver, copper, and amethyst were discovered as early as 1604, and coal was known by at least the last quarter of the same century. Development of minerals on more than a local basis did not occur until many years later. The growth of mineral production has been gradual, and to-day the mineral industries make a large annual contribution to the wealth of Canada and occupy the attention of many people. Ontario, British Columbia, Alberta, and Nova Scotia produce nearly all the mineral wealth, 38 per cent coming from the first, 22 per cent from the second, and 87 per cent from the four. (Study Figs. 244–250.)

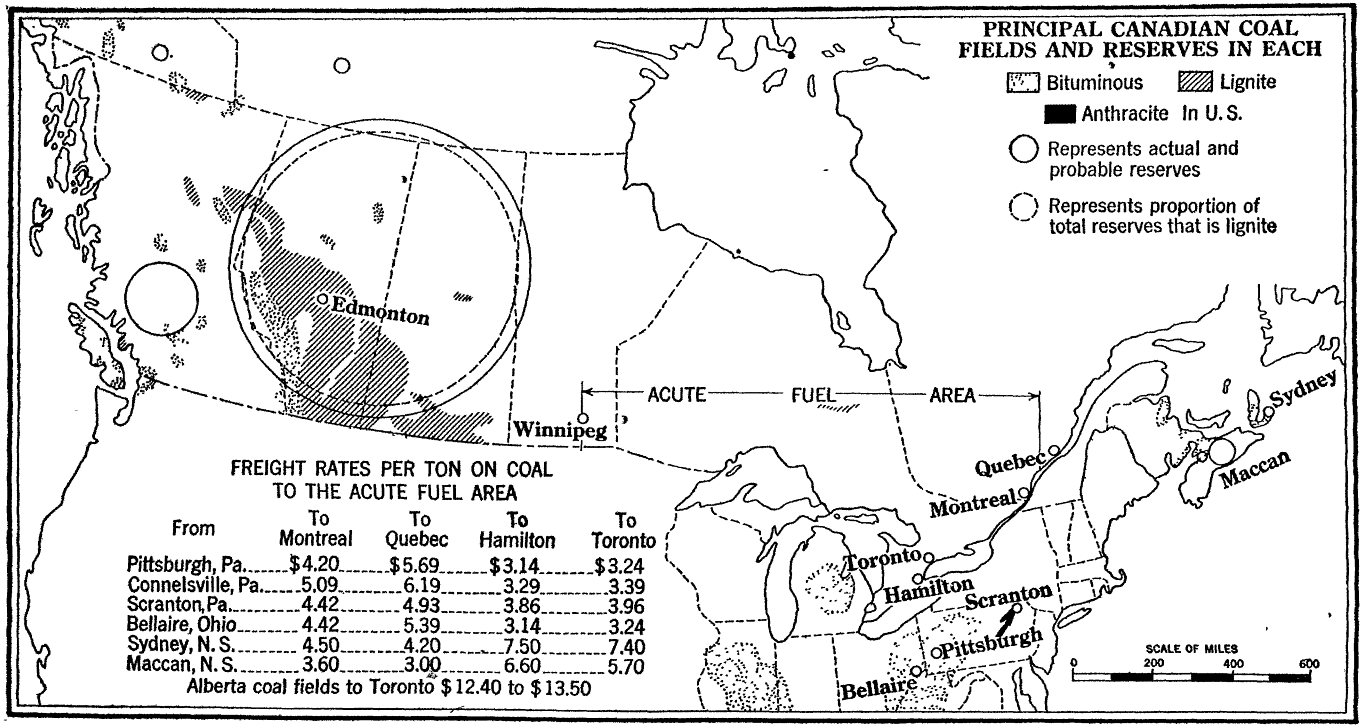


FIG. 244.

The Great Lakes–St. Lawrence Region, where most of the people of Canada live, is coalless, as the principal coal deposits are in the extreme East and the Far West. Most of the western coal is lignite. Freight costs restrict the use of eastern coal in the acute fuel area and exclude western coal.

Principal Minerals.—The average annual value of the mineral production of Canada is \$202,000,000, and the non-metallic group, inclusive of clay and structural materials, greatly exceeds the metallic in value. Coal is more than twice as valuable as gold, the next in rank, which is followed by nickel, silver, copper, and asbestos. The first five are the only minerals having an average annual value greater than \$10,000,000.

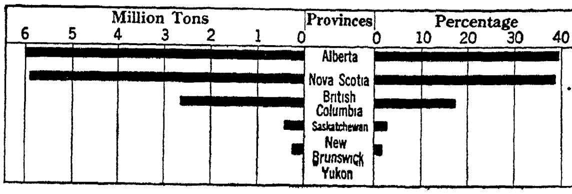
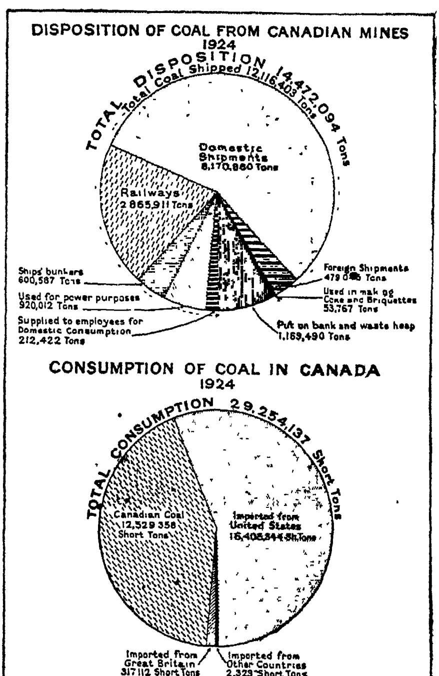


FIG. 245.—Coal Production of Canada by Provinces. Average, 1922–1924.

Alberta and Nova Scotia together produce more than 77 per cent of the coal mined in Canada annually.

Nearly four-fifths of the coal is produced in Nova Scotia and Alberta, and most of the remainder in British Columbia. The production is, therefore, on opposite sides of the country, leaving the interior coalless and largely dependent upon the United States for its supply (Fig. 244). Ontario and British Columbia take first rank as producers of precious metals, copper, and nickel. Ontario produces nearly three-fifths of the silver, four-fifths of the gold, all of the nickel, and one-third of the copper. It is exceeded by British Columbia only in the production of copper.



Courtesy Natural Resources Intelligence Service.

FIG. 246.

In 1924 Canadian mines supplied 43 per cent, and those of the United States 56 per cent of the total coal consumption of Canada.

Surplus.—The mining industry has already reached a stage where a net surplus of some minerals is available for export. Precious metals lead the list, followed by asbestos, nickel, lead, and copper. The production of asbestos and nickel constitutes most of the world's supply.

MANUFACTURES

Growth.—The growth of manufacturing industries in Canada has been slow compared with the growth in the United States and in other countries having greater population. However, the growth has been steady during the last half century. In 1870, less than 200,000 people were employed in manufacturing, and now the number exceeds 1,500,000. During the first half of the nineteenth century, manufacturing was mostly of the household type. The so-called "Industrial Revolution," or development of the factory system of production for a national or international market, commenced shortly before Confederation (1867), and is still in progress. A large-scale organization of industries is not widespread at present, but has begun and will probably increase with an increase in population that gives a market to large amounts of standard products. (Study Figs. 251–254.)

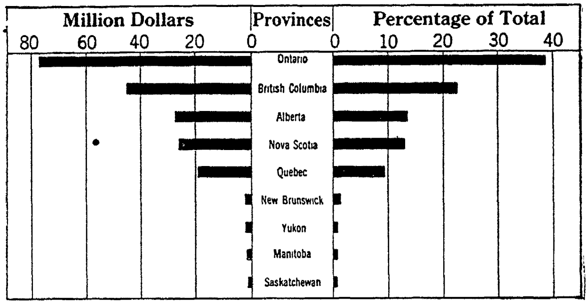


FIG. 247.—Mineral Production by Provinces. Average, 1922–1924.

The total value of the mineral output of Ontario and British Columbia exceeds that of all other provinces combined.

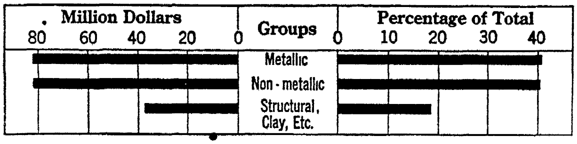


FIG. 248.—Mineral Production of Canada by Major Groups. Average, 1922–1924.

The metallic and nonmetallic minerals are nearly equal in value.

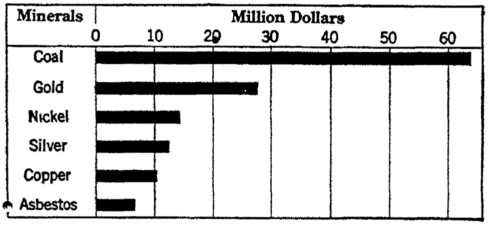


FIG. 249.—Principal Minerals of Canada. Average, 1922–1924.

Coal is, by far, the most important mineral produced in Canada.

Canada's manufacturing industries are built chiefly upon the use of domestic raw materials and a home market for the finished products. There is a present tendency to import raw

materials to supply manufactures not only to home markets, but also to world markets. This is shown by the imports of raw cotton from the United States, hides from Argentina, rubber from the Straits Settlements and Malay Peninsula, sugar from the West Indies, wool from Australia and New Zealand, and the exports of manufactured articles which now equal about two-thirds of the imports of such articles, measured by value. True measures of the importance of manufactures are the value added by the manufacturing process and the number of people employed, but, since fluctuation in prices greatly lessens the value of the first as a measure, both methods are used in the following discussion.

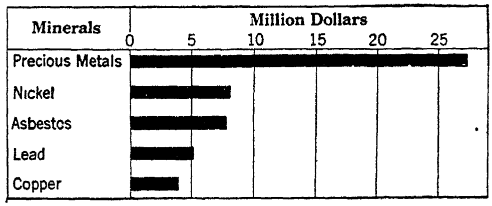


FIG. 250.—Principal Surplus Minerals of Canada. Net Exports, Average, 1923–1925.

Canada's principal surplus minerals are precious metals, nickel, asbestos, lead and copper. Its surplus of precious metals exceeds $27,000,000.

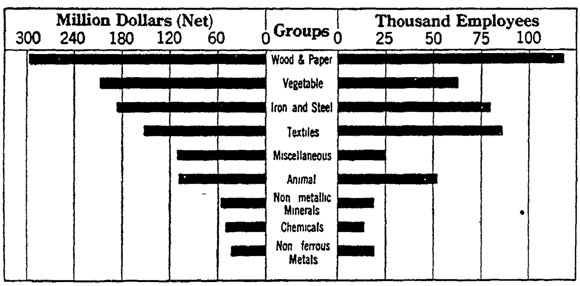


FIG. 251.—Manufacturing Industries by Great Groups of Products. Average, 1921–1923.

With the exception of textiles, Canadian manufactures are based upon the utilization of domestic raw materials. Forest industries lead whether measured by net value of products or by the number of employees.

Principal Industries.—The leading groups of manufactures are wood and paper, vegetable, iron and steel, and textile products, measured by net value. However, the textile industries rank second in the number of people employed, and iron and steel third. The high rank of the iron and steel group in

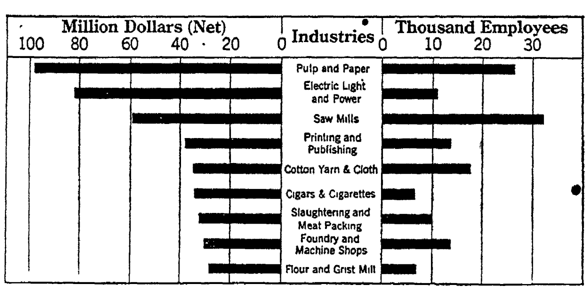


FIG. 252.—Leading Manufacturing Industries of Canada. Average, 1921–1923.

Two of the three principal manufacturing industries are based upon the forest resources. How is the industry that ranks second in value likewise related to the forest resources?

recent years is indicative of the industrial evolution that is taking place, as most of the raw material is imported. The present production of Canadian iron ore is insignificant, as it cannot compete with that from Minnesota and Michigan, and Wabana, Newfoundland.

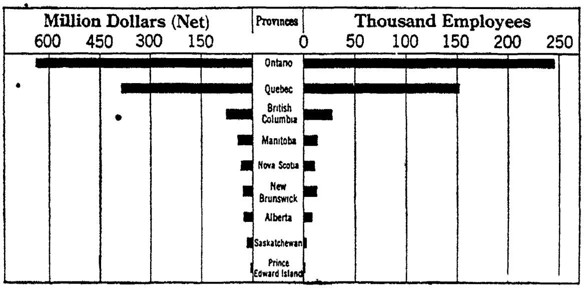


FIG. 253.—Manufactures of Canada by Provinces. Average, 1921–1923.

More than four-fifths of the manufacturing employees of Canada are in Ontario and Quebec and those provinces produce a like proportion of the net value of all manufactures.

The first and third leading individual industries—pulp and paper, and sawmills—are based on local raw materials from the forest. However, sawmills give employment to more people than does any other industry. The second—electric light and power—is based upon the great water-power resources. The high position of this industry is suggestive of the absence of coal in the regions where it is greatly needed, and the effort of the Canadian people to solve this problem by utilizing one of their resources.

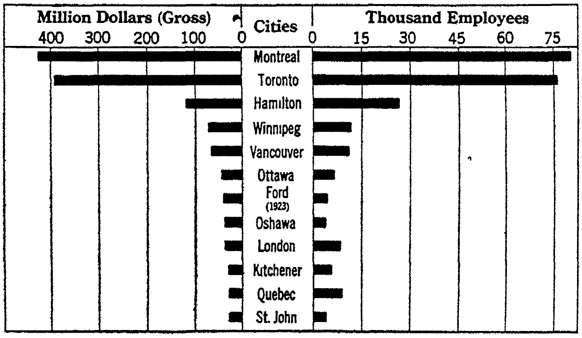


FIG. 254.—Leading Manufacturing Cities of Canada. Average, 1921–1923.

Nearly a third of the total product-value of Canada's manufacturing industries is produced in the two cities of Montreal and Toronto, and they have nearly a third of the employees.

Distribution.—Ontario and Quebec are the leading industrial provinces, as they produce more than four-fifths of the net value of all manufactures of Canada and have a like proportion of the employees. Iron and steel, and coal for manufacturing purposes, are imported very largely from the United States, since the coal and iron of the Maritime Provinces are too distant to compete. The development of water power to supplant

coal is progressing rapidly in this region. All other provinces are of comparatively small manufacturing importance.

As the growth and prosperity of cities is intimately associated with the development of manufactures, the localization of the latter becomes of great interest. There is a striking concentration of manufactures in a few cities; Montreal and Toronto produce nearly a third of the product-value and have nearly a third of the employees. Hamilton is a poor third in rank, and all other cities are of relatively small importance although each is of considerable significance locally.

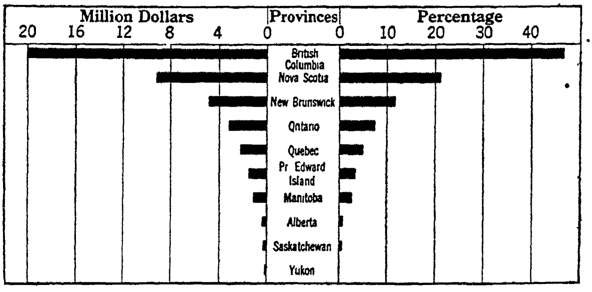


FIG. 255.—Fisheries of Canada by Provinces. Average, 1922–1924.

British Columbia fisheries have a greater value than those of the Maritime Provinces and Quebec combined.

Can Canada become a leading manufacturing country?

FISHERIES

The First Industry.—Fishing was the first industry to be followed systematically by Europeans in what is now the Canadian domain. When Cabot first sighted the North American mainland in 1498, he named it "Bacalaos" — the Basque word meaning codfish. It was the early French fishermen who contributed the familiar name Cape Breton. Many other names stand as

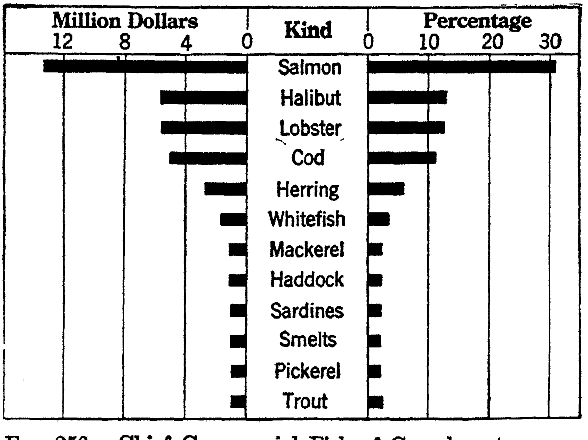


FIG. 256.—Chief Commercial Fish of Canada. Average, 1922–1924.

Salmon, halibut, lobster, and cod contribute nearly seven-tenths of the total value of the fisheries.

memorials to the pioneers on Canadian fishing grounds. The French, Spanish, and Portuguese were there before 1502, plying their trade in the primitive manner of the time. Though the fishing industry got an early start, it remained small for more than three centuries. Its principal growth has occurred in comparatively recent decades. In 1844 the value of the catch was only about $125,000; by 1860 it was somewhat in excess of $1,000,000; and ten years later it amounted to $6,000,000. To-day the industry is conducted on a large commercial scale on the Atlantic and Pacific coasts and in inland waters. It yields products worth $42,000,000 and gives employment to 70,900 people, five times as many being engaged in the sea fisheries as in the inland fisheries. The sea fisheries are discussed elsewhere (pp. 482, 518).

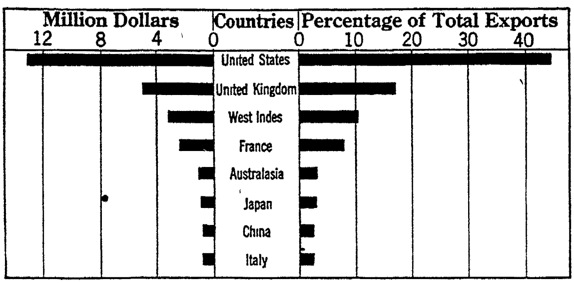


Fig. 257.—Principal Foreign Fish Markets of Canada. Average, 1922–1924.

The United States takes nearly 45 per cent of Canada's fish exports.

Inland Fisheries. — The inland fisheries are small compared with the sea fisheries of either coast, yet amount to about $4,960,000 annually, or 11 per cent of the total value of Canadian fisheries. Nearly two-thirds of the total catch is taken in Ontario. Whitefish is the most important inland commercial fish and is found in the Great Lakes, Lake Winnipeg, and its tributaries. Others are salmon, which are found in the streams of Quebec, and whitefish, dore, and lake trout to the west and north of Lake Winnipeg.

Surplus.—The production of fish products greatly exceeds the home demand. The value of the net exports is equal to three-fifths of the total value produced annually. The imports are relatively insignificant. The United States and the United Kingdom are the principal markets, twice as much going to the former as to the latter. The other important markets are the West Indies, France, Australia, and Brazil.

COMMERCE

Growth.—Canada's commerce experienced a steady growth until the beginning of the World War, when the closing of old avenues of world trade and the opening of new ones brought about rapid development.

Until the time of this rapid growth, the imports had considerably exceeded the exports, but with the stimulus of high prices and war production this situation was reversed and so continued until about 1921. The decline in trade during the following year shows the influence of the general depression following war conditions. (Fig. 258.) It is estimated that about 25 per cent of the 40 per cent decline is accounted for by the decrease in prices, which leaves a substantial actual growth in Canadian commerce.

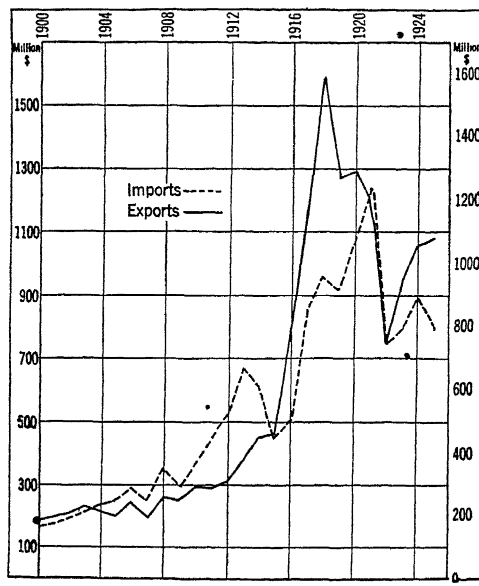


FIG. 258.—Growth of Canadian Commerce.

Previous to the World War Canadian foreign commerce grew at a fairly uniform rate with imports exceeding exports in value. The War greatly stimulated the growth and exports exceeded imports. Though the usual post-war depression occurred, Canadian foreign trade remains at a much higher level than it ever attained at any time before the War. Is "value" an altogether satisfactory method of measuring commercial growth? Why?

Character of Trade.—The home produce that enters Canadian commerce is the product of its farms, forests, mines, and seas. Canada is primarily a seller of raw and partly manufactured material and a buyer of manufactured articles. This is likely to be true of new countries in their earlier stages of economic development. Vegetable, forest, and live-stock products are the three dominant classes of the export trade, constituting more than four-fifths of the total. About two-fifths is of the first group, one-fourth of the second, and one-seventh of the third. Canada's imports are more evenly divided among four classes, viz., agricultural and vegetable products, fibers and textiles, iron products, and non-metallic minerals, which make up three-fourths of the total. Most of these materials are not produced in sufficient amount at home, or are not produced in advantageous locations for general distribution throughout Canada. (Fig. 259.)

Countries with which Canada Trades.—Two countries buy from Canada nearly all it has to sell, and sell to it nearly all that it buys. About two-fifths of the exports are purchased by the United States and

more than three-fifths of the remainder by the United Kingdom. Other important buyers of Canadian produce are Australasia, Japan, the West Indies, Germany, and Belgium. To Great Britain it sells chiefly wheat, flour, cheese, silver, bacon, fish, and furs; and to the United States, lumber, wood pulp, paper, silver, gold, nickel, asbestos, flaxseed, hides, fish and furs. It purchases two-thirds of its imports from the United States. These are chiefly manufactured articles for which Canada does not possess the raw materials or has not yet developed manufacturing industries, such as various metal goods, cotton, wool, and silk fabrics; and raw material such as coal, cotton, rice, tobacco, and hides. A large part of the remaining imports are purchased from the United Kingdom, West Indies, and France, the products being primarily manufactured articles. (Fig. 260.)

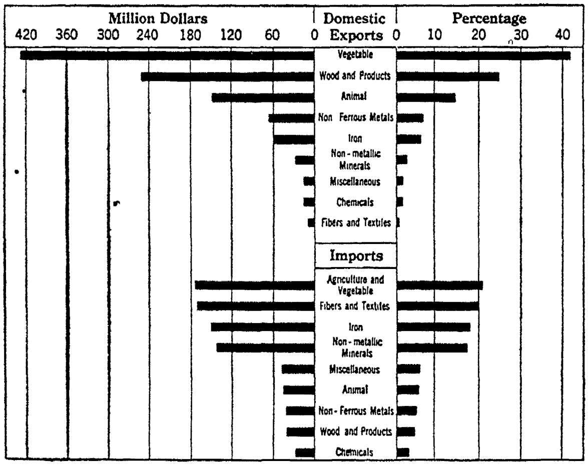


FIG. 259.—Commerce of Canada by Classes of Products. Average, 1923–1925.

Farm and forest products contribute more than four-fifths of Canada's exports. Most of its imports are manufactured goods.

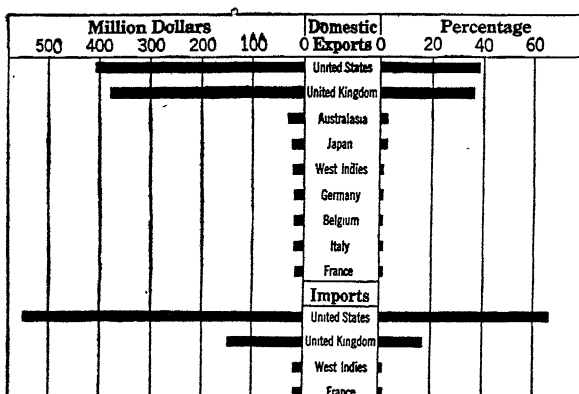


FIG. 260.—Canadian Commerce by Principal Countries. Average, 1923–1925.

Canada sells nearly four-fifths of its exports to the United States and the United Kingdom, and buys two-thirds of its imports from the United States.

Commerce by Regions.—The commerce of Canada may be conveniently divided into four principal commercial regions. The Quebec and

Ontario region which, commercially, is essentially the St. Lawrence Lowland and the Lake Superior area, is by far the most important, having three-fourths of the total commerce. This commerce is about equally divided between Quebec and Ontario, that of the latter exceeding that of the former by only about a tenth. The principal ports are Montreal, Quebec, Toronto, Coaticook, St. John, Bridgeburg, Niagara Falls, Windsor, and Sarnia. This is the region with most of the population, large production, excellent inland transportation, good harbors, and accessibility to the great markets of western Europe. British Columbia ranks second. The Maritime Provinces are third in exports but fourth in imports. St. John and Halifax are the dominant ports for the Maritime Provinces; Emerson and North Portal for the Prairie Provinces; Vancouver and Victoria for British Columbia. The Maritime Provinces and British Columbia have excellent water outlets, while the commerce of the Prairie Provinces must depend upon inland transportation with the principal markets in the United States. (Fig. 261.)

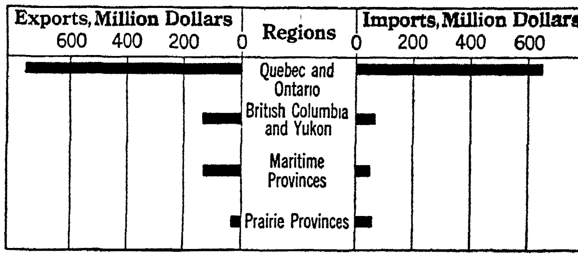


FIG. 261.—Exports and Imports of Canada by Regions. Average, 1923–1925.

Ontario and Quebec handle three-fourths of the foreign commerce of Canada. Do all the goods exported by these provinces originate in them? Do they consume all the goods imported?

POWER

Water Power.—Water-power development, before the recent war, took place where coal costs were high or natural conditions especially favorable. During the war the cost of coal increased greatly and the power required was greater, hence water-power development was stimulated. The distribution of water-power plants and industrial districts served are shown on the map, Fig. 268. Practically every large industrial center of Canada now utilizes hydroelectric power and has abundant potential resources accessible. Quebec and Ontario not only have more than four-fifths of the water power developed, but have nearly two-thirds of the minimum available power in Canada. British Columbia ranks third in developed power, but is exceeded by Manitoba in potential power. The water-power resources of Ontario, Quebec, and Manitoba

are fortunately located, as these provinces are without coal. The developed water power of Canada is 4,290,000 horse power;[1] but this is being increased constantly and is likely to be augmented greatly in the future, as it is less than a quarter of the known minimum resources. Pulp and paper mills are the largest users of water power, 731,700 horse power, or about 17 per cent of the total, being used in these industries alone. Among the leading water-power using countries in the world, Canada ranks second to the United States, and is exceeded only by Switzerland and Norway in its per capita development.

TABLE XIX

AVAILABLE AND DEVELOPED WATER POWER

Provinces	Available Horse Power		Installed Horse Power, Jan. 1, 1926
	Minimum, in 1000's	Maximum Dependable for 6 months, in 1000's	
Quebec	6,915	11,640	1,747,386
Ontario	4,915	6,808	1,784,842
Manitoba	3,270	5,769	183,925
British Columbia	1,931	5,103	414,702
Saskatchewan	513	1,087	35
Alberta	475	1,137	34,107
Yukon and Northwest Territories	125	275	13,199
New Brunswick	50	120	44,531
Nova Scotia	20	128	65,327
Prince Edward Island	3	5	2,274
Total	18,255	32,075	4,290,428

Coal.—The present coal production of 15,000,000 tons is only about one-half of the consumption. Slightly more than half the production comes from Alberta and British Columbia, and most of the remainder from Nova Scotia. Approximately 250,000 tons of the eastern coal goes to New England, and 750,000 tons of western coal to the northwestern United States, while the St. Lawrence Lowland industrial district imports approximately 15,000,000 tons from the Appalachian region of the United States as the transportation cost prevents the use of

[1] Jan. 1, 1926.

Canadian coal. The coal resources equal about 17 per cent of the world's known coal. By far the most of the reserves are in Alberta, and are largely lignite and subbituminous, while those of British Columbia are bituminous. The anthracite reserves are relatively small and are in the west.

TABLE XX

WATER POWER OF LEADING COUNTRIES IN 1924

Countries	Developed		Available
	Horse Power in 1000's	Per 1000 Population	Horse Power (Minimum), in 1000's
United States	11,000	97	28,000
Canada	3,570	387	18,255
France	2,500	63	4,700
Italy	2,300	59	3,800
Norway	2,000	740	5,500
Japan	1,750	29	5,220
Switzerland	1,750	437	2,500
Sweden	1,600	266	4,400
Germany	1,100	18	1,250

TABLE XXI

ESTIMATED AVAILABLE COAL RESERVES IN CANADIAN PROVINCES

In Millions of Tons)

Province	Metric Tons	Province	Metric Tons
Alberta	1,072,627	Northwest Territories	4,800
British Columbia	76,035	Manitoba	160
Saskatchewan	59,812	New Brunswick	151
Nova Scotia	9,719	Ontario	25
Arctic Islands	6,000		
Yukon	4,940	Total	1,234,269

TRANSPORTATION

Railroads.—Canada's broad expanse of territory and the 8,700,000 people scattered along its southern border present a big problem of transportation and communication, a problem that must be solved before the resources of large portions of the country can be developed. The productive parts of Canada are separated from each other by areas of wilderness, e.g., the region between Quebec and New Brunswick; and the area north of lakes Superior and Huron, separating the industrial region of the St. Lawrence Lowland from the agricultural region of the Prairie Plains. In a country like Canada, with its sparse population, a western agricultural section that produces mainly for export, and an eastern manufacturing section producing largely for consumption in distant parts, efficient transportation is a necessity. When Canada depended upon water routes for transportation, its economic life practically stood still during the season when its waterways were closed by ice.

Railways are the fundamental means of modern land transportation and must precede settlement in the present age. This necessity has led to the extension of government aid to private railroads in order that they might be built through sparsely settled districts with little available traffic, or in advance of settlement. While much has been done in railway construction, the present mileage forms only a fraction of what must be built eventually. The first railway was built in 1830, but the railway era began in 1851. At that time there were only 66 miles of railroad in Canada. Since then the main mileage has been expanded to 42,400, which is a creditable growth when one considers the small population of the country. Much of this growth has been brought about through government aid or construction, 22,000 miles now being owned and operated by the Dominion Government. About one-fourth of Canada's railway mileage is in Ontario. The Dominion now has three transcontinental lines, one the Canadian Pacific, and two of the Canadian National Railways. It is probable that immediate future growth will consist of the construction of a network of feeders to these main lines in order to better serve and develop the country now open for settlement.

Canals.—Before the railroad era, the St. Lawrence and Ottawa rivers and Great Lakes were the principal avenues of transportation. However, portages were necessary along these routes, hence canal construction has been designed as a means to overcome these obstacles. The canals of Canada may be placed in four groups: (1) The St. Lawrence and Great Lakes group, consisting of nine canals, including the

Welland and Sault Ste. Marie, which are of first importance; (2) the Ottawa and Rideau rivers group, consisting of four canals; (3) the Richelieu River group, having two canals; and (4) a miscellaneous group, consisting of Trent, St. Peter's and St. Andrew's canals. Together they provide 465 miles of navigable waterways, though their relative importance is not to be measured by their length. Most of the canal traffic occurs during the summer and fall months, and consists chiefly of bulky or heavy mine products, such as coal, and farm products, especially wheat.

Other Means of Communication.—The telegraph, telephone, wireless, and mails are probably of only slightly less importance than railroads in tying together the widely scattered settlements of the country and making effective its economic life. The first telegraph line was built in 1847, while telephone development dates from 1880, and scores of radio-telegraph stations have been installed since 1903. Government and private systems now extend throughout the settled areas and reach many remote points of the Dominion. Highways and motor transport are likewise being extended rapidly.

THE FUTURE

The northerly location of Canada, its climatic limitations, erroneous conceptions of its resources, and the known opportunities offered by the United States, determined that its development should be delayed until the more enticing opportunities offered the immigrant in the United States became fewer. That a region with such extensive forest, mineral, water, and sea resources should eventually attract a population and develop transportation, commerce, and manufactures, is inevitable, though such development has scarcely more than made a start. To-day the cultivated land and food production per capita are exceeded only by those of Argentina, while the potential agricultural land of Canada is capable of providing food and homes for several times the present population. Its vast forest resources have scarcely been touched, though they now engage the attention of many people and rank second to food products in importance. Great varieties of minerals are known to exist, and most of the country still remains to be examined. All these resources may supply raw materials to manufacturing industries, which are yet in their infancy, while its streams and coal may supply the power. The development of these industries should result in the expansion of transportation and wider extension of commerce to world markets, and should advance settlement to habitable areas now unpeopled. Thus Canada stands to-day as a nation looking forward to a more

intensive utilization of its geographic resources, and to the time when many more people will find homes within its borders. *Has it a sound foundation upon which to build? What have the people done in its geographic regions thus far, and what may they do?*

PROBLEMS

1. Will Canada become the most important unit in the British Empire?

2. Have the people of Canada attained more than half the industrial development possible?

3. Is it probable that Canada can produce four or five times its present agricultural output?

4. Can Canada become one of the three or four leading manufacturing and commercial nations of the world?

5. Are the natural assets of Canada more favorable to the evolution of a strong and prosperous nation than are those of either Brazil or Argentina?

CHAPTER XXIV

THE MARITIME PROVINCES AND NEWFOUNDLAND

THE MARITIME PROVINCES

THE Maritime Provinces have been aptly described as the "land that was passed by." Though the first settlement in Canada was established in Nova Scotia, and though the Provinces are supplied with resources they have remained essentially static for many decades. During the past century the flow of immigrants "passed by" to the more promising interior lands. Hundreds of miles of uninhabited forest separate the region from the more densely peopled St. Lawrence Lowland and Ontario plains, and the St. Lawrence—the natural highway—is closed by ice for half the year. Even the Intercolonial Railway, which passes north of Maine in order to remain in Canadian territory, is used but little and is operated at a loss. Only the coastal fringe of Nova Scotia and New Brunswick, and Prince Edward and Cape Breton Islands are at all densely populated.

In general the surface is mountain-like in character with the highlands, lowlands, and large coastal indentations trending northeast–southwest in conformity with the Appalachian system. A large part of New Brunswick and Prince Edward Island has an average elevation of only a few hundred feet but is by no means flat. In northwestern New Brunswick is a broken, highly hilly district reaching an elevation of 2500 feet, and a similar plateau-like country borders the Bay of Fundy. The central ridge of Nova Scotia reaches an elevation of 1500 feet in Cape Breton Island. Aside from Prince Edward Island, which is mostly arable, the region contains many more or less isolated fertile areas, though it is essentially a rugged, hilly country. Among these productive areas are the Annapolis–Cornwallis Valley in Nova Scotia and the St. John Valley in New Brunswick. Much of the region is forest-covered and is traversed by many streams. The coastline is long and, with its many good harbors and shallow off-shore waters teeming with fish, has wielded a strong influence in the development of the region.

The region has abundant rainfall, and sufficiently long and warm summers to mature all temperate fruits and other crops and produce a

luxuriant growth of native forest. Though it is located in the latitude of southern France, the winters are cold, owing chiefly to the cold continental northwest winds, and secondarily to the onshore winds from the Labrador Current.

Many minerals of economic value occur. Coal is abundant. Probably few places in the world possess conditions as favorable for the manufacture of iron and steel as are found in Cape Breton Island where coal is mined at tidewater and limestone for flux is quarried nearby. The steel mills are located on the harbor at Sydney, and the ore is obtained by a short voyage from Newfoundland where it is mined at tidewater. New Brunswick likewise has extensive coal deposits.

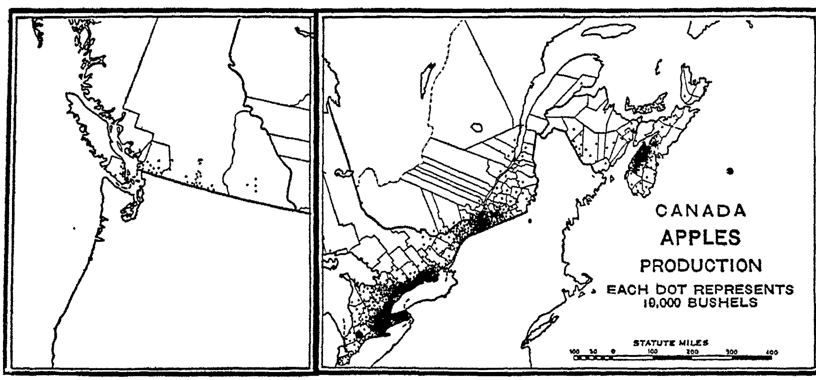
The present relative backwardness of the region is due only in part to geographical factors. Difficulties of transportation, except by way of the Atlantic, the "patchy" character of good soil areas, and rugged surface are serious handicaps, but it is likely that unfavorable United States tariffs are a greater disadvantage. The resources and location of the region bring its products into competition with those of New England. If reciprocity existed, it is probable that industrial development would take place.

UTILIZATION OF FOUR PRINCIPAL RESOURCES

Agriculture.—The agricultural areas and present development are related closely to the geological structure. Fully three-fourths of the agricultural land is on Carboniferous and Triassic formations because they are near the coast, have fertile soils, and are low and sheltered. Prince Edward Island, the diked tidal marshes at the head of the Bay of Fundy, and the Annapolis–Cornwallis Valley typify the better agricultural lands. Other fertile areas occur on similar rock formations, in New Brunswick and Cape Breton Island, on the alluvial bottoms of numerous river valleys, and in patches on the higher lands. The total acreage is estimated to be 16,200,000 acres, or about half the total area. However, much of the acreage is covered with forests and remote from transportation, and other areas must be drained or diked. Agriculture is most developed in Prince Edward Island—a land of agriculture, fishing, and fur farming. Over four-fifths of its area is arable, but less than half the arable land is now in crops. About 55 per cent of New Brunswick and 37 per cent of Nova Scotia are arable, but only a tenth of these lands is cultivated.

Except in Prince Edward Island, agricultural development is yet in its infancy. More than four-fifths of the acreage of field crops is hay and clover, and oats, which is indicative of live-stock raising and the

production of dairy products. Cattle are more widely distributed than any crop unless it be hay, but few are raised on the relatively unsettled, hilly, crystalline uplands. Other important crops are potatoes, fruit, turnips, and mangolds, while lesser ones include spring wheat, buckwheat, barley; and beans. The Annapolis–Cornwallis Valley, known as "The Garden of Nova Scotia," and celebrated for its apples, extends from the Bay of Minas to the head of Annapolis Basin. It is about 80 miles long and from 10 to 15 miles wide. North Mountain separates it from the Bay of Fundy and gives protection from the northwest winds and fogs, and South Mountain forms the other side of the valley. Only about a tenth of the valley is under cultivation. The warm winter winds from the Bay of Fundy produce a pronounced moderating effect,



From Finch and Baker, Geography of the World's Agriculture.

FIG. 262.

The Niagara Peninsula of Ontario, the north shore of Lake Ontario, and the Annapolis Valley of Nova Scotia are the chief centers of commercial apple production of Canada. The Annapolis Valley is one of the more famous apple producing centers of the world.

the average winter temperature of Annapolis being five to six degrees higher than that of Halifax. The Bay likewise affords protection from killing frosts in spring and fall, giving the valley a long growing season. Even on very still nights during the critical danger periods, the air movements created by the exceptionally high tidal range of the Bay constitute an additional factor in protection from frost. Another important advantage possessed by the valley is its location near ports from which its annual crop of one to two million barrels may be exported.

Fur Farming.—It is probable that twenty years ago no one in Prince Edward Island expected ever to amass a fortune. However, two enterprising farmers conceived the idea of breeding black silver foxes as the pelts commonly brought prices of \$1000–\$2000 each. The fur of the domesticated animal was more valuable than that of the wild as it was

taken when prime and was uninjured. The industry proved so successful that the value of the animals for breeding purposes soon far exceeded the value of the pelts. A pair of five months' old pups brought \$12,000–\$16,000 before the War, and at least one mature pair of proven fecundity brought as much as \$35,000. These prices led to a rapid expansion of the industry and the production of animals for breeding purposes. The industry spread to the other provinces and to other countries, especially to the United States, and to the breeding of other fur-bearing animals. In 1922 the value of the animals on the fur farms of Prince Edward Island was \$4,000,000, which was nearly half as much as the combined value of farm cattle, hogs, and sheep, and gave an annual

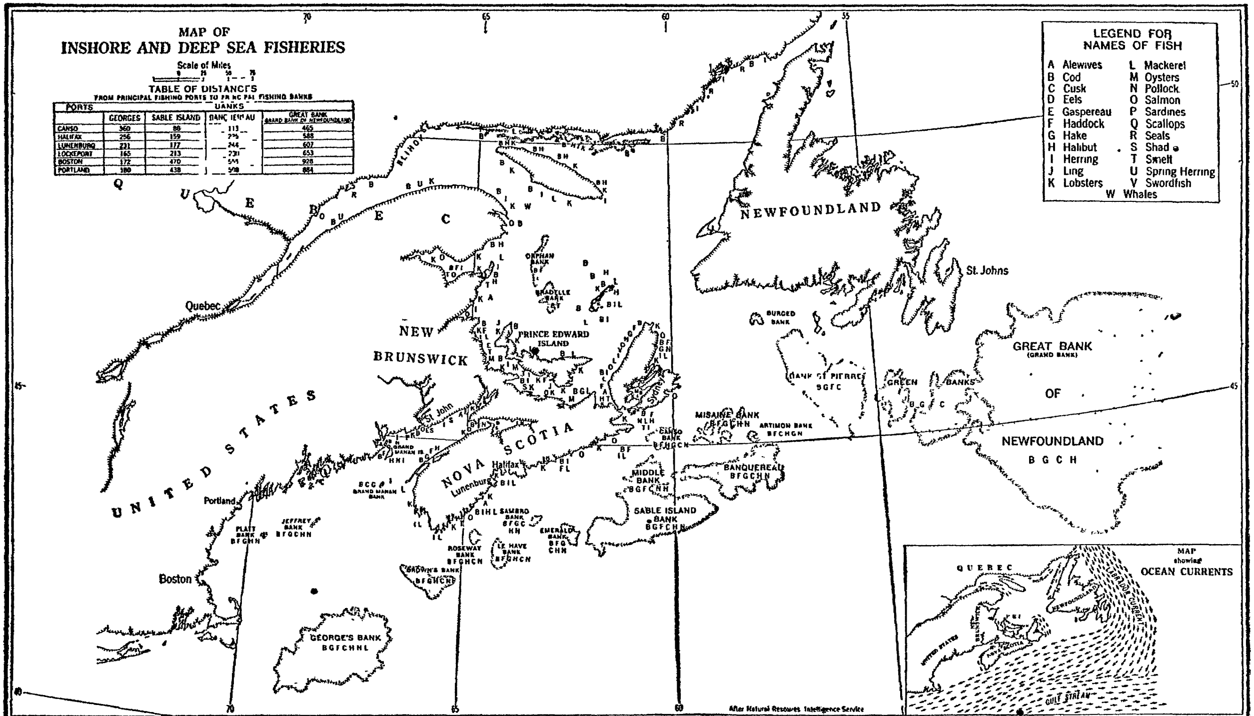
TABLE XXII

FUR FARMING IN THE MARITIME PROVINCES AND CANADA IN 1924

	Number of Farms	Value of Land and Buildings	Value of Animals	Gross Revenue
Prince Edward Island	458	\$ 809,593	\$3,149,400	\$1,474,934
New Brunswick	106	192,542	809,821	434,632
Nova Scotia	158	143,065	479,035	184,901
Quebec	295	332,798	937,581	323,514
Manitoba	34	250,578	572,496	174,445
Ontario	314	400,377	1,384,389	392,000
Saskatchewan	25	80,180	150,358	14,286
Alberta	70	173,130	579,877	144,947
Yukon	20	49,965	99,315	25,762
British Columbia	71	144,695	227,115	38,375
Canada	1,551	\$2,576,923	\$8,389,387	\$3,207,796

revenue of nearly a million dollars. Fur farming likewise met with success in Nova Scotia and New Brunswick, so that the Maritime Provinces have nearly five-sixths of the total gross value of animals on fur farms of Canada. There are now over 22,000 silver foxes and over 8700 other fur-bearing animals on the fur farms of the Dominion. Such has been the growth of a new industry which is capable of great expansion.

Fisheries.—The Atlantic fisheries of Canada are an historic industry. Breton and Basque fishermen frequented the "banks," especially the Grand Banks, in small vessels, as early as 1502, catching fish by hook and line and marketing them in France. When it was discovered that fish were as plentiful in-shore as on the outer banks, huts were built on shore



After Map by Natural Resources Intelligence Service.

FIG. 263.

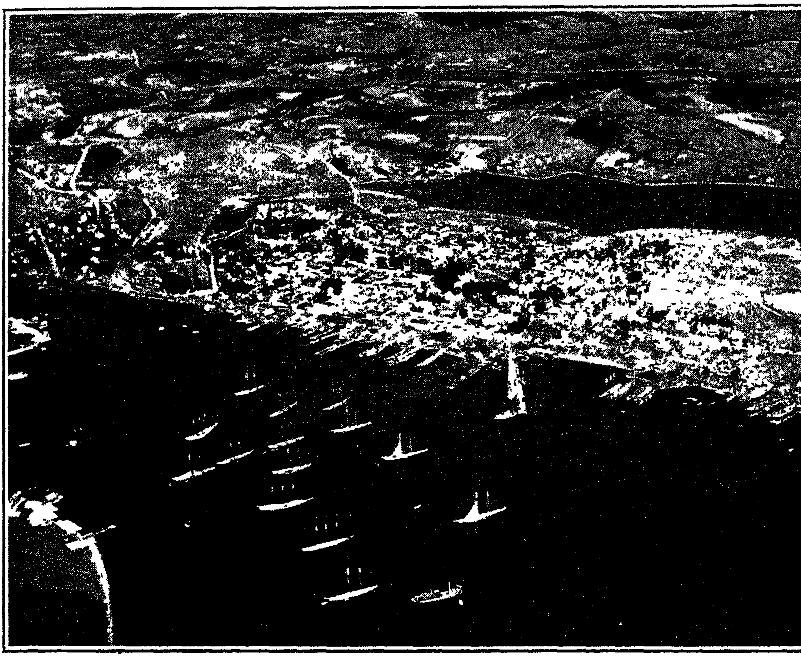
The fishing banks in close proximity to the Maritime Provinces are among the best in the world. Both deep-sea and in-shore fisheries are carried on, but the latter is the most important.

and fish were salted and dried and taken to France at the end of the season. Later permanent fishing villages were established, and these became the bases of operations. The natural conditions that have fostered these fisheries since they were first initiated by Europeans are exceptionally favorable. From Grand Manan to Labrador extends a fishing coast of some 5000 miles. Including the Bay of Fundy and the St. Lawrence Gulf, Canada has about 215,000 square miles of fishing grounds, or more than four-fifths of the area of the fishing grounds of the North Atlantic. The long shoreline, numerous harbors, relatively shallow and cool off-shore waters, and the presence of abundant fish food provide one of the world's best fishing grounds. Here are feeding and spawning grounds of such valuable food fish as the cod, lobster, halibut, herring, mackerel, and haddock. The first four rank next to salmon among the fish produced in Canada. The lobster fisheries are said to be without a peer. Government assistance in conservation and protection, maintenance of hatcheries, awarding of bounties, and aid in marketing has been an important factor in developing the fisheries. For generations the scarcity of soil and the bleak climate of much of the coastal lands discouraged agriculture and caused people to turn to the sea as a source of livelihood, as available resources of the sea were plentiful. However, with the introduction of the large steam trawler and motor, the movement has been checked and the number of persons engaged in the fisheries has remained essentially static during the last decade while the investment in equipment has quadrupled.

The Maritime Provinces bear a relation to the world's supply of fish similar to the relation of the Prairie Plains Region to the supply of wheat. Nearly 37 per cent of the total value of the Dominion's fisheries comes from these Provinces, Nova Scotia leading with nearly three-fifths of the total for the region. The in-shore fisheries, which are carried on within 10–12 miles of the coast, are more important than those of the deep sea. (Figs. 256, 257.) They are safer, entail less hardship, require less equipment, and are more profitable, as a large part of the catch is shipped fresh each day to Quebec, Ontario, and the New England States. The deep-sea fisherman requires larger and more expensive equipment and may be out for several weeks or even months, and must pack and salt the fish on board ship. Lunenburg is the chief center. (Fig. 264.) About 90 per cent of the cured fish goes to the West Indies, South America, and European countries, especially Spain. Halifax is the center of the industry, although nearly every village along the coast has its fishing vessels, drying sheds, and canneries.

Forests.—The forests have long been a heavy contributor to the wealth and revenue of the region, and with the application of modern

methods of conservation may remain so indefinitely. They are similar to those of New England, red spruce being the characteristic tree. Others of commercial value include white spruce, balsam fir, white pine, hemlock, yellow birch, maple, beech, and cedar. Many billions of feet of timber are available for exploitation. Recent estimates give Nova Scotia a forest resource, including all classes of merchantable



Courtesy Royal Canadian Air Force.

FIG. 264.—The Fishing Village of Lunenburg on the Atlantic Coast of Nova Scotia, Southeast of Halifax.

TABLE XXIII

PRODUCTION OF FORESTS PRODUCT OF MARITIME PROVINCES IN 1922

	Sawmill Products	Per Cent	Pulp	Per Cent	Per Cent of Total
New Brunswick.........	$9,550,141	73.4	$6,205,312	84.1	77.3
Nova Scotia...........	3,257,905	25.0	1,166,747	15.8	21.7
Prince Edward Island....	185,895	1.4	....	......	.9
Total.............	$12,993,941	99.8	$7,372,059	99.9	99.9

material, of 30,000,000,000 board feet—10,000,000,000 board feet suitable for lumber, and 31,000,000 cords of pulp wood. A partially completed survey (three-fifths complete) of the Crown lands of New Brunswick reveal similar resources in excess of 18,000,000,000 board feet. Present exploitation of forest resources is carried on most extensively in New Brunswick, where the annual income from forest products is two-fifths as large as the gross agricultural revenue. Measured in value, this province alone produces over three-fourths the lumber, lath, shingles, and pulp of the region.

Mining.—Compared with New England, the Maritime Provinces are rich in mineral resources, but they appear poverty-stricken in comparison with the resources and mineral production of the Middle Atlantic States. A few resources may be of great significance in a small area and such may be the future of Nova Scotia and New Brunswick. Large deposits of coal of high quality occur accessible to tidewater, and are likely to be of increasing importance. Except for the small deposits of anthracite in Rhode Island, the coal deposits of the Maritime Provinces are the only ones on the Atlantic seaboard of North America. The rich Sydney fields now produce nearly three-fourths of the annual output of Nova Scotia. With high-quality hematite iron ore only 400 miles distant by boat from Newfoundland, with abundant coal suitable for blast-furnace coke, gas, and steam, with good harbors such as Sydney, Louisburg, and New Glasgow for shipment up the St. Lawrence to the coalless and ironless sections of Quebec and Ontario, or to other parts of the world, Cape Breton Island and Pictou County of Nova Scotia should become very important coal-producing, and iron and steel manufacturing centers. The iron and steel industry of this section is now one of the most important in Canada. Coal is the only mineral of outstanding importance produced at the present time. It constitutes over 95 per cent of the total value of Nova Scotia's mineral production and nearly half of that of New Brunswick. Together, these provinces produce two-fifths of the annual output of Canada. Gypsum ranks second in value but amounts to only about a million dollars annually. As with coal, the deposits are at or near tidewater and are capable of extensive development. Over four-fifths of the gypsum produced is marketed in the United States. Much of it is resold to the Canadians in the form of plaster. Among other minerals of present or of potential economic significance, should be mentioned oil shale, gold, salt, manganese, limestone, and excellent clay.

Cities

For several decades, urban population has been growing at the expense of rural. This tendency has become more pronounced in recent years, especially in Nova Scotia where 43 per cent of the people are now city dwellers. During the past two decades the proportion of urban population has changed from a quarter to more than a third in the region as a whole. This movement is in keeping with the revival of industrial development. All the more important cities have developed on harbors.

Halifax–Dartmouth is the leading center and gives employment to the largest number of people in its industries. As the terminal of the Canadian National Railways with extensive improvements to make it a great ocean port, with an ice-free, siltless outer harbor a mile square and 70 feet deep, and an inner harbor of 10 square miles with a 45-foot depth at the piers at low water and average tidal range of 4 feet, free from troublesome currents, protected at the entrance by islands, and on the main trade route between western Europe and the northeastern United States, 616 miles nearer Liverpool than is New York, Halifax expects to become one of the great Atlantic ports. At present its commerce exceeds $75,000,000, exclusive of transit trade, which is half again as large as that of Quebec and three-fifths that of St. John. Like the latter city, it is of special importance to Canada as a winter port when the St. Lawrence is closed by ice. Large quantities of grain, lumber, dairy products, wood pulp, fish, and fish products are exported, together with imports of raw sugar, coffee, tea, crude oil, machinery, textiles, and many other manufactures.

TABLE XXIV

Comparative Table of Distances from Halifax and New York to Six Trade Centers

To	Miles from Halifax	Miles from New York
Liverpool	2,450	3,100
Pernambuco	3,451	3,678
Rio de Janeiro	4,611	4,748
Montevideo	5,586	5,723
Buenos Aires	5,701	5,838
Cape Town	6,423	6,786

St. John is the second city in size and in number of people engaged in manufacturing industries. It is the focal point of the province, and

$12,000,000. This production does not nearly equal home demands. Newfoundland's population of 259,000 is confined almost exclusively to the coast. The interior is essentially empty so far as human occupation is concerned. Fully a sixth of the people live in St. John's, and nearly all the other settlements are coastal fishing stations.

Mineral Resources.—Minerals undoubtedly occur in considerable variety and quality. The Wabana iron ores of Conception Bay are one of the world's greatest deposits. The probable reserves are estimated to be 3,635,000,000 tons of high-grade hematite. The average annual production is about 750,000 tons, most of which goes to the blast furnaces of Sydney though some reaches Philadelphia. Other minerals now produced are limestone, lead, and silver, but their total value is only a few thousand dollars.

Forest Industries.—The manufacture of pulp and paper from the forest resources is the most important new industry that has come to Newfoundland for centuries. Newfoundland possesses excellent advantages for the development of this industry. The timber is cheap and excellent for pulp, is near good harbors free from ice on the south coast, and occurs in dense stands; the rivers are suitable for conveying logs to the mills and for power; Newfoundland is much nearer the markets of Europe than is the United States or Canada; and there is an abundance of labor, especially during the off season for fishing. In 1924 the exports of paper and pulp amounted to nearly $6,000,000. The product-value of the pulp and paper industries equals that of the fisheries. Newfoundland outranks Norway as a producer of newsprint stock and is likely to become one of the world's leading paper producers.

Fisheries the Dominant Industry.—The cool and shallow waters of the Grand Banks, which lie 100 miles off the southeast shore, are one of the world's finest fishing grounds. In addition to the cod fisheries of the Banks, and those nearer shore, 15,000–20,000 fishermen journey to the coasts of Labrador during the summer. About the middle of March each year, the sealing fleet sets out from St. John's to the sealing grounds along the north shores. Here on the ice floes, the hair seal gives birth to its young. Only the bachelor seals are killed, but the annual catch is declining. The hair seal is not the same as the fur seal. Its skin is used for the manufacture of fine leather goods, such as belts, bags, cigar and cigarette cases, etc. The oil extracted finds a market as an illuminant, for the manufacture of margarine and soap, and medicinally as a cod-liver oil substitute. The cod is by far the most important product of the sea. It accounts for four-fifths of the total value of all fishing products, nearly all of which are exported. The principal markets are Spain, Portugal, Italy, and Brazil.

Fishing is well-nigh the sole interest of the coastal people of both Newfoundland and Labrador. This is to be expected since the land is poor and inhospitable, and the off-shore waters, countless bays and open sea teem with fish. The people have little interest in agriculture. Some of the fishermen have not even a garden, and agriculture has actually declined in recent decades. Fishing has been the dominant interest of Newfoundland's people for centuries. Its economic life throughout its history has been based upon the fisheries of the Grand Banks. The people think in terms of cod, herring, halibut, lobster, and seal. This reliance upon the sea is shown in a number of ways. Fully four-fifths of the people classified in the four principal occupation groups—fishermen, mechanics, farmers, miners—are fishermen. The total annual value of the fishery products is more than twice the value of agricultural crops, about ten times that of all minerals produced, and about equals that of forest products. In 1924 fishery products formed more than half the value of all exports from the colony, the only other large item being forest products, especially paper and pulp. Out of the $21,000,000 worth of exports in 1924, fisheries were responsible for more than $10,500,000, and the forests for more than $6,500,000. Later export data are not available but it is probable that exports of paper and pulp products now exceed fishery products, since the value of each produced in 1927 was approximately $13,500,000. This was the first time in the history of the Colony that the fisheries had a serious industrial rival.

PROBLEMS

1. Will the future growth of commerce, industry, wealth, and population in the Maritime Provinces give them a leadership in Canada comparable to the leadership now held by the North Atlantic States in the United States?

2. The Maritime Provinces possess opportunities greater than those of New England for commercial and industrial development.

3. Will Halifax and St. John become the leading ports of Eastern Canada?

4. It is more than three centuries since the first English settlement was made in Newfoundland. Has it reached the highest stage of industrial development that may be expected?

5. Would reciprocity with the United States produce a development of the Maritime Provinces comparable to that of New England?

6. Can the Maritime Provinces maintain a population greater than that of the Pacific Mountain Region?

7. What will be the two leading industries of the Maritime Provinces?

8. Will the proposed Great Lakes–St. Lawrence Canal benefit or injure the Maritime Provinces?

CHAPTER XXV

THE GREAT LAKES–ST. LAWRENCE REGION

Canadian Shield Section.—The southern portion of the Canadian Shield is tributary to the St. Lawrence Lowland. Its general characteristics have been described elsewhere. As a result of its geological history, it has a great variety of metallic minerals, most notable of which are nickel, copper, gold, and silver. Glaciation left much of its surface without soil, and hence sterile, though here and there are drift-filled valleys and small patches of glacial till. However, these soil areas are commonly located in poorly drained country and are difficult of access, hence of limited crop value. The most striking exception is the "Clay Belt" south of James Bay. Glaciation also accounts for the vast number of lakes and muskegs that serve as reservoirs to regulate the stream flow; also for many of the falls and rapids that provide large water-power resources. Trees thrive in the soil areas or where the rocks are broken sufficiently for the roots to gain a hold. In general the southern portion is densely forested with valuable timber. Forests, minerals, and water power constitute the principal resources now utilized by man. Only a relatively small number of people actually live in the Canadian Shield portion of the region. Its water power, its minerals, its forests, its furs and other assets are tributary to the industrial centers of the Lowland. The labor of reclaiming its scattered and commonly isolated soil areas and its large proportion of barren rock and boulder-strewn land make it less desirable to the prospective home builder than the fertile western prairie where transportation facilities and markets are already available.

The Lowland.—The St. Lawrence Lowland extends from Lake Huron through Quebec and is divided into two major sections by an extension of the Shield which crosses the St. Lawrence between Kingston and Brockville. The surface is largely drift-covered sedimentaries and affords a great variety of fertile soils, in contrast with the hard granitic rocks of the Shield at the north. All parts have a climate suitable to the growth of cereals and temperate fruits. Since the Lowland extends some 600 miles from east to west and 300 miles north and south, and the western lake peninsula is nearly surrounded by water, there is also a variety

in climate. Crops such as wheat and corn will thrive best in the more southerly lake peninsula, and oats and barley at the north. This combination of fertile soils and favorable climate makes agriculture one of the greatest permanent industries of the region, if not the greatest. It was the agricultural opportunities and natural means of communication afforded by the Great Lakes and St. Lawrence that led to the relatively early settling of these lowlands. The St. Lawrence and the Lakes are still among the region's greatest assets.

Its mineral resources are comparatively small and it is without coal. However, the many streams that come tumbling from uplands of the Shield compensate for the absence of mineral fuels as they provide a superabundance of power conveniently located. Fertile soils, favorable climate, good natural transportation facilities giving access to the open ocean, and vast tributary forest, mineral, and power resources have made this the most desirable region of Canada. Here are fully three-fifths of the population of the Dominion. Measured in terms of population, manufacturing, commerce, large cities, total wealth, educational institutions, or influence in national affairs, the St. Lawrence Lowland is essentially Canada.

AGRICULTURE

Agricultural Area.—Agriculture is confined almost exclusively to the glacial drift and alluvial soils of the lake peninsula and the lower St. Lawrence Valley, particularly on its southern side.(1) The humid, continental type of climate favors the production of hay and forage, pasture, and oats.(2) The opening of the cheap and fertile lands of the Prairie Plains and the migration of grain growing thereto made competition in the Lowland extremely difficult.(3) These conditions, coupled with good home markets, led to the development of mixed farming and dairying, and especially the production of butter and cheese. Only in the more southerly section of the lake peninsula does corn and hog raising approximate the production per square mile of Iowa. Where lake and marine influences moderate the climate, fruits are grown for market. Noted apple regions are in the Montreal district and along the northern shores of lakes Erie and Ontario, while the Niagara peninsula produces the less hardy grapes and peaches. At present, less than a fifth of the estimated arable land is in crops—the region has nearly a third (31.6 per cent) of the arable land of Canada,—four-fifths of which is in the western or Ontario section. It, therefore, has the potential agricultural resources which, combined with the denser population and accessibility to good markets at home and in the United States, should enable its people to

maintain their relative agricultural position in competition with other regions of the Dominion.

Leading Crops.—The Lowland region is dominantly a hay and forage and oats country, as these crops are raised on more than three-fourths of the cultivated land. In the lower St. Lawrence section, nearly nine-tenths of the crop acreage is devoted to these crops, and more than three-fifths to hay and forage alone; and in the Ontario section the proportion is seven-tenths and two-fifths, respectively. Other crops include wheat, mixed grains, barley, buckwheat, and corn. Over four-fifths of the wheat is grown in the lake peninsula, where all but a fifth is the winter variety. The Lowland has long been an important agricultural area, and even though the open grasslands of the west have developed rapidly, it still produces 37 per cent of the total crop value of the Dominion. (Fig. 265.)

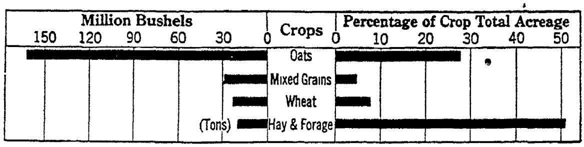


Fig. 265.—Principal Crops of St. Lawrence Lowlands. Average, 1923–1925.

Hay and forage crops occupy more than half the total crop acreage, and oats occupy more than 27 per cent. Why are these the leading crops at present?

Live Stock and Dairying.—A climate and soil favorable to the production of stock food, accessible markets in the large industrial centers and abroad, and inability to compete with the west in cereals encouraged mixed farming, the raising of live stock, and specialization in the dairy industry. The region has half or more of each of the domesticated animals of Canada except sheep, with cattle and hogs leading. Milk cows represent 65 per cent of the total value of cattle, which is indicative of the development of dairying. Specialization has reached a high stage in the Quebec lowlands, where there are over 1700 cheese and butter factories and where the milk cow constitutes nearly seven-tenths the value of cattle. However, the larger area, more favorable climate, soil, and markets have enabled the Ontario section to produce dairy

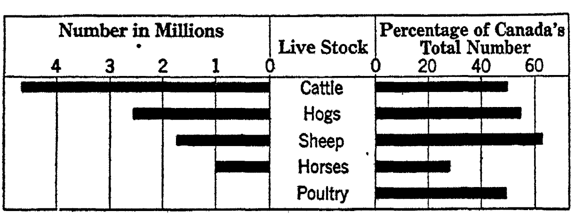


Fig. 266.—Live Stock of the St. Lawrence Lowland. Average, 1923–1925.

Half the cattle, half the poultry, more than half the hogs, and nearly two-thirds the sheep of Canada are in this region. Why?

products having a total value of more than twice that of Quebec. In the Ontario section are produced more than half the dairy products of Canada. In recent years the Lowlanders have been able to compete successfully in the British market with the New Zealanders, Dutch, Swiss, Danes, Belgians, and French. (Fig. 266.)

MINERALS

It is the Canadian Shield that contributes the metallic mineral wealth, while the Lowland contributes most of the non-metallics. The region produces annually about four-fifths of Canada's output of gold, nearly half the silver, a third of the copper, nearly half (48 per cent) of the total mineral wealth, three-fourths of the world's nickel, and four-fifths of the world's asbestos. It is without coal and has little iron and oil. The present mineral-producing areas are widely scattered and give rise to isolated settlements whose future is dependent upon the mines. The famous Sudbury copper and nickel mines north of Lake Huron were opened when the Canadian Pacific was built through the district. Local timber is used to roast the ores to eliminate the sulphur, and the iron is then separated. Refining of the resulting copper and nickel matte is done in southern Ontario, in New Jersey, and in Europe, where it is nearer the principal markets. The Cobalt district northeast of Sudbury produces silver and Cobalt ore, which is concentrated at the mines and sent to Ontario or abroad for refining. The silver production of the region gives Canada third place among world producers. The chief gold district is in the Porcupine Mountains at Timmins, north and west of Sudbury. This district claims the most productive single gold mine in the world. Thetford, some 60 miles south of Quebec, yields the asbestos.

WATER POWER

Here is the most highly developed portion of the Dominion, yet without coal! For many years its factories and homes have been as dependent upon the United States for coal as has any section of that country, since Nova Scotia coal could not compete beyond Montreal. However, Nature has endowed few other places in the world with such a large potential water power. This is due to (1) the abundant and fairly uniform rainfall, (2) falls and rapids in the numerous streams that descend from the Canadian Shield bordering the Lowland on the north, and many that are due to glaciation, including Niagara Falls, (3) the geological structure, (4) the Great Lakes, and numerous smaller lakes,

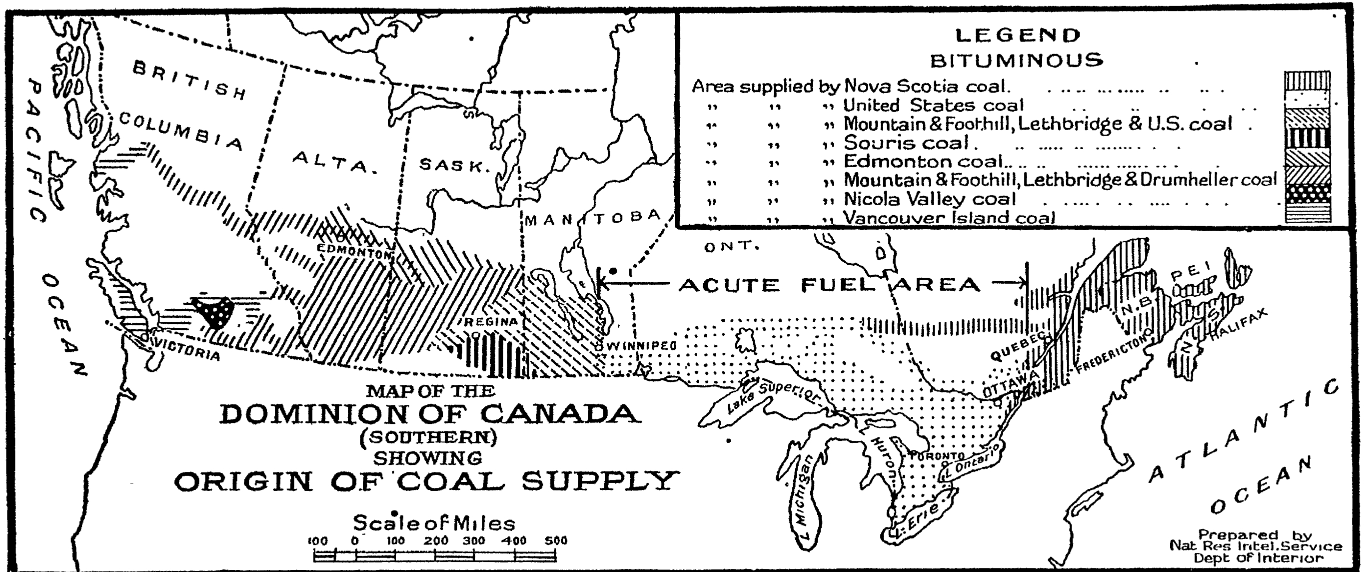


FIG. 267.

The Great Lakes–St. Lawrence Region is seriously handicapped by a lack of coal. It depends very largely upon coal from the United States.

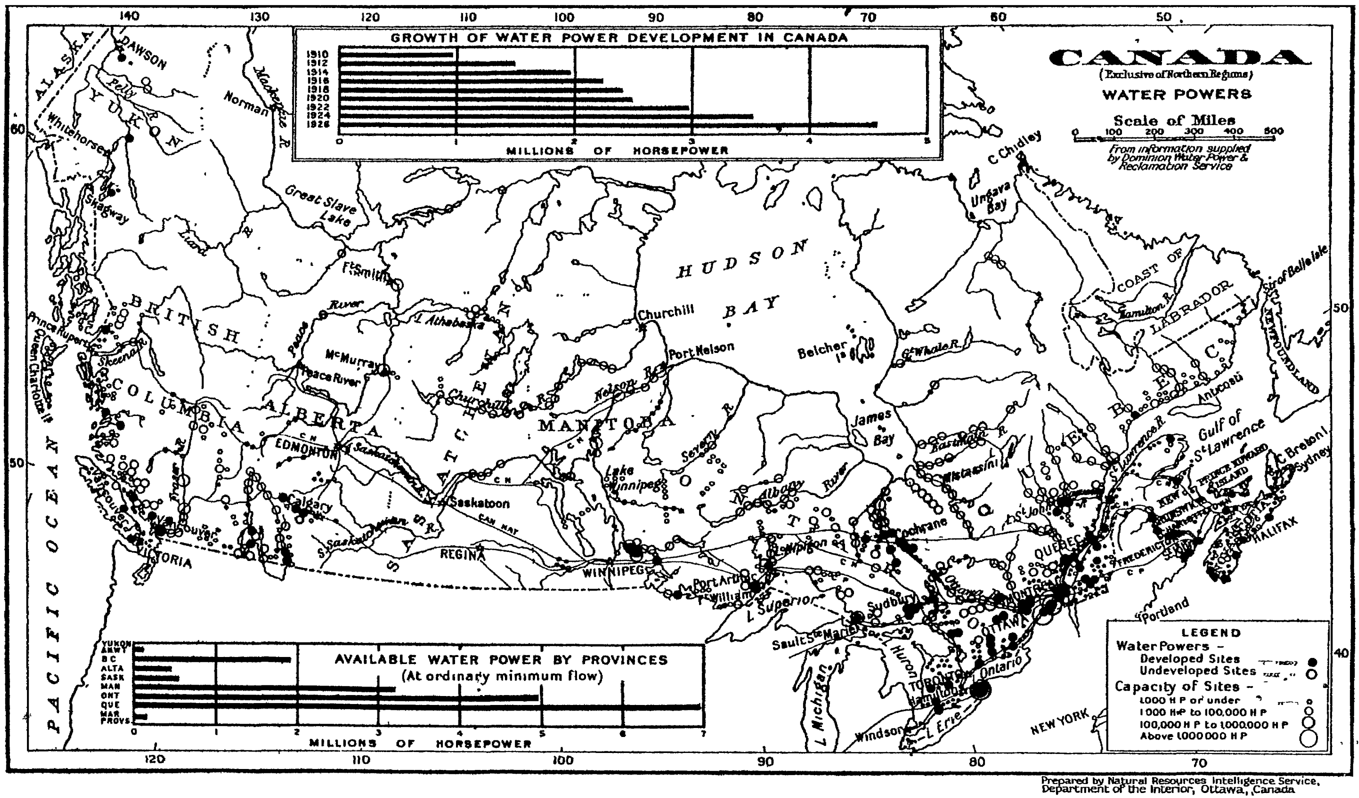


FIG. 268.

Most of the developed water power of Canada is in the Great Lakes–St. Lawrence Region—the Acute Fuel Area Compare with Fig. 267. Ontario and Quebec now have more than four-fifths of the developed water power of Canada, and nearly two-thirds of the minimum available.

Courtesy Royal Canadian Air Force.

FIG. 269.—As the Aviator Sees Niagara Falls, with Canada on the Right.

On the far side of the Canadian Falls may be seen two of the Canadian water power plants. The American power plants are on the left and farther down the gorge below the bridge. More than 1 500,000 horse power is developed on the two sides of the Falls.

muskegs, and forest cover on a comparatively level upland, that serve as storage reservoirs. These conditions give to the region a minimum potential power of nearly 12,000,000 horse power with 18,500,000 dependable for six months. Furthermore, a very large part of these reserves are located near centers demanding power and they are well distributed throughout the region. Only in recent years has extensive use been made of this great source of energy. Now the region has over 3,500,000 horse power installed, which is more than four-fifths of Canada's total. Installations that will produce several hundred thousand additional horse power are under construction as these words are being written. Water power has been a vital factor in the development of the pulp and paper industry, and in mining to a lesser extent. It requires 100 horse power to produce one ton of paper per day, hence that industry is almost restricted to water power and now uses nearly a sixth of the total developed. The power reserve of the region is sufficient to meet the needs of a much larger population and a much greater industrial development. (Figs. 267–269.)

MANUFACTURING

Manufacturing has made great progress in recent years and is intimately associated with the utilization of local raw materials. However, a notable exception is the textile industry of Quebec, which has long depended upon a foreign source for both raw material and power. The more recent development of water power will lessen this dependence. Abundant agricultural products obtained both locally and in the Prairie Plains, large forest resources, abundant water power, good home markets and a water outlet to foreign markets, and a protective tariff on many manufactured products have favored industrial development. More than four-fifths of the total net value of manufactures and of the manufacturing employees of Canada are in this region. More than half of the manufactures of Canada are produced in the Ontario section. Food products, forest products, wood pulp, paper, lumber, textiles, leather goods as boots and shoes, and electric power plants are among the leaders. The Lowland Region is the premier pulp and paper region, producing 85 per cent of the Dominion's total. Here are also the leading industrial cities. Montreal and Toronto far surpass all others, turning out annually nearly a third of Canada's total manufactures. (Fig. 254.)

CITIES

With the development of manufacturing on a modern factory scale, people tend to concentrate in small areas and hence give rise to large

Courtesy Royal Canadian Air Force.

FIG. 270.—A Large Wood-pulp and Paper Mill at Hull, Quebec, Opposite the City of Ottawa and on the Ottawa River.

Scores of such mills now utilize the abundant water power of the St. Lawrence region.

cities. Three-fifths of Canada's people live in the Great Lakes–St. Lawrence Region, and nearly all are in the Lowland. Nearly three-fifths of the population is urban, and this proportion is increasing yearly, a situation that indicates the manufacturing progress that is taking place. All except two of the large cities of Canada are located here. Because of the numerous natural assets previously named, this region has offered the greatest opportunities to man in the past and, for the same reasons, is likely to do so in the future. It appears unlikely that man will ever find any other similar area of the Dominion so well adapted to his needs.

Montreal, situated in the midst of the Lowland and in the most populous section of Canada, at the head of ocean navigation on the St. Lawrence, and 300 miles nearer to Europe than is New York, at the foot of inland navigation on the Great Lakes, where railroads from the interior converge, and where an abundance of water power is available, is the premier city in size, in manufacturing, and in commerce, even though its port is closed by ice over four months of the year. Its location makes it the most convenient and economical center for transshipment of exports and imports of both central and eastern Canada. It ranks first among the world's grain ports, and handles a fifth of Canada's total exports and imports and more of its transoceanic commerce than all other ports combined. The leading exports include wheat and wheat flour, other grains, lumber, and wood pulp and paper; and the principal imports handled are raw and manufactured cotton, raw and manufactured wool, raw sugar, tea, and numerous other manufactures.

Toronto is the second city of Canada and is the gateway to the southwestern lowlands which are one of the most densely populated and wealthiest parts of the Dominion. It has a good lake harbor, is the railway focus of the section, and the distributing center of a prosperous agricultural and manufacturing district. Other cities of a hundred thousand or more population are Hamilton, Ottawa, and Quebec.

Quebec, the French-Canadian capital, with its ancient citadel, gray stone buildings, and " Lower Town " with its winding passages, narrow streets, and old houses, is one of the most picturesque cities in America. Located on the St. Lawrence where the Lowland begins, and over 100 miles northeast of Montreal, it is in a much less favorable position for commercial development. It has a large passenger traffic from ocean vessels that do not ascend to Montreal, and from passengers who desire to start the railway journey as soon as possible. It has large available water-power resources, and its railroads provide good connections with the Maritime Provinces and a more rapid access to the northwest than by way of Montreal. Its commerce is similar in many respects to that of the latter city, but is very small in comparison. Among Canada's

PROBLEMS

1. Can the Prairie Plains Region surpass the North Central Section of the United States in agricultural development?

2. What will be the permanent type of agricultural development in the Prairie Plains Region?

3. The proposed Great Lakes–St. Lawrence Canal will be of greater benefit to both the Prairie Plains and St. Lawrence Lowland regions than to any other region of North America.

4. Can the Arctic Meadows of Canada maintain as many people as now live in British Columbia?

5. Will the Arctic Meadows ever produce as much meat as the Prairie Plains?

6. Can manufacturing become an important industry in the Prairie Plains Region?

7. Will the development of irrigation make Alberta as productive as California?

8. Can the Prairie Plains Region maintain a population as large as that of the St. Lawrence Lowland?

CHAPTER XXVII

THE PACIFIC MOUNTAIN REGION

THE Pacific Mountain Region is a vast mountainous mass whose snow-capped and glacier-clad peaks rise above a vast forest wilderness that extends downward into its deep valleys and plateau-like areas. It is the highest and most rugged part of Canada, many summits reaching a height of 10,000 feet and a few exceeding 16,000 feet the highest being Mt. Logan, 19,540 feet. The coast is characterized by long, deep, narrow, well-sheltered indentations or fiords, extending far inland, giving the region more harbors than can ever be utilized for the development of commercial centers. Some of these indentations are continued into the highland beyond, as ravines or glens. Others are too deep for good anchorage, have too narrow and winding entrances for safe and easy passage of ocean vessels, or are too difficult to reach from the interior, while a majority have too precipitous and rugged surroundings for the development of important commercial cities. In addition, Vancouver Island shuts off nearly half the coast from direct connection with the open sea. The coast is also fringed by islands separated by deep channels, forming an "inside passage" through which ships may sail for nearly 800 miles protected from the winds and storms of the Pacific.

The Fraser, Yukon, Skeena, and Stikine are the most important river systems. Though some of the rivers and the associated lakes are navigable for limited distances, most of the streams are characterized by numerous rapids and falls which give the region a minimum potential water power of more than 2,000,000 horse power, about a fifth of which has been utilized thus far. The water-power reserve, plus the coal reserve, provides one essential for the development of manufactures which is likely to meet all probable future demands.

The population of 528,700 is confined almost exclusively to the southern part and particularly to the southwestern coast, where more than two-fifths of the total is in seven cities. Some 4000 people in the Yukon mining district, 6400 in the port of Prince Rupert, and a few distributed along railway routes are the exceptions. A little more than half of the people are in cities and villages, while the remainder are scattered among

the lumber and mining camps, or are engaged in agriculture and stock raising along the valleys or over the grasslands. During the last decade the population has increased one-third, a growth exceeded only by the Prairie Plains, and greater by nearly 12 per cent than the average for the country as a whole. This growth has been in the southern district, the north having lost more than half its people during the same period. Though fully three-fifths of the population are of British origin, the demand for laborers, the opportunities offered in the fisheries, lumber camps, and mining centers, intensive agriculture and horticulture, and accessibility by sea makes the problem of Oriental immigration a difficult one.

Forest Industries.—The Pacific Mountain Region is a land of forests except on the far northern Arctic slope. On the basis of climate, the forest of British Columbia may be classified into seven broad districts, as shown in Table XXV. It is evident that 100,000,000 acres is suitable only for the production of timber, with the exception of some 15,000,000 or 20,000,000 acres, included in these figures, which has some value for grazing purposes. With less than 9 per cent of the area of British Columbia arable, it is clear that the future of the region depends very largely on the timber that can be produced on this area. The climate and soil are excellent for forest growth. It is believed that without drain upon the growth, the annual cut can be 8,000,000,000 board feet, which is about four times the present cut. However, proper conservation methods, reforestation, and protection from fire and insects must be enforced.

TABLE XXV

British Columbia Forest Districts

	Acres
Douglas Fir Coast District	18,000,000
Northern Coast District	20,000,000
Interior Wet Belt District (Gold and Cariboo Ranges)	22,000,000
Yellow Pine District (semi-arid interior valleys)	5,000,000
Plateau and Rocky Mountain District	26,000,000
Upper Fraser Basin District	14,000,000
Northern Interior District	15,000,000
Total	120,000,000
Arable Land	20,000,000
Net Forest Area	100,000,000

The Douglas Fir Coast District and the Interior Wet Belt are the leading lumber-producing districts. The first, with its heavy precipitation, high humidity, long growing season, and high average temperature with absence of extremes, produces a coniferous forest which is equaled for rapidity of growth, density, and yield per acre only along the Washington and Oregon coasts. Much of the timber cut along or near the indented mainland coast and on Vancouver Island is brought to tidewater, where it is made into huge rafts (Fig. 277) and towed to sawmills located on some convenient harbor. Areas of mature trees yield 10,000–100,000 feet of lumber per acre, and average 20,000 feet. Douglas fir is the most important commercial type, yielding about two-thirds of the lumber cut.

The climate of the Interior Wet Belt resembles that of both the coast and dry belts, with a comparatively humid atmosphere, a precipitation of 30–40 inches; a relatively long growing season, considering the high latitude and altitude; warm summers; cold winters, free from long periods of extreme low temperatures; and heavy snowfall, which assures an abundance of spring moisture. (Fig. 229.) This region is known as the Interior Wet Belt and has a dense, rapidly growing forest cover, giving a large yield per acre though not equal to that of the Douglas Fir Coast District. Cedar, hemlock, Douglas fir, spruce, and lodgepole pine thrive throughout most of the district, and western white pine occurs in the watersheds of the West Thompson and Columbia rivers. Though second in commercial importance to the Coast District, this district may even excel the lumber possibilities of the latter because of its large area of potential forest land, which is now covered with young trees.

The most important commercial trees of the Pacific Mountain Region are the Douglas fir, used for structural purposes, mine timbers, ties, and paving blocks; red cedar, the most important Canadian wood, for shingles; Alaskan pine or western hemlock, used extensively for structural and pulp purposes; and Sitka spruce and Engelmann's spruce, which are especially valuable for airplanes and pulp manufacture.

Lumber, shingles, and lath are the leading forest products, valued at $40,000,000 and equaling more than one-third of Canada's production. In addition this region produces about one-tenth of the wood pulp and paper. The Prairie Plains Region has been for many years the principal lumber market, but shipments are now going to Japan, China, and South Africa, while the west coast of South America is a potential market.

Mining.—The mining district is a continuation of the Cordillera of South America, Mexico, and the United States. This mountain area contains mineral wealth throughout its length. Coal was discovered

in 1835, but the first mine was not opened until 1851 at Nanaimo and it has been worked ever since. Gold was discovered in the late 1850's, and the Fraser River rush began in 1858. In 1861 the Cariboo district was entered by prospectors and the Williams and Lightning Creek districts were discovered. The Cassiar district was opened in 1873, and prospectors entered the Yukon before 1880. Klondike mining began in 1894 and the Yukon district reached its peak in 1900 with a gold production of $22,000,000. As the crude methods of mining in the Yukon have become less effective, the decline in production has been marked so that it averages only about $1,900,000 annually. The development of lode mining, which is now eleven times as important as placer mining, followed railroad construction in southern British Columbia in the late

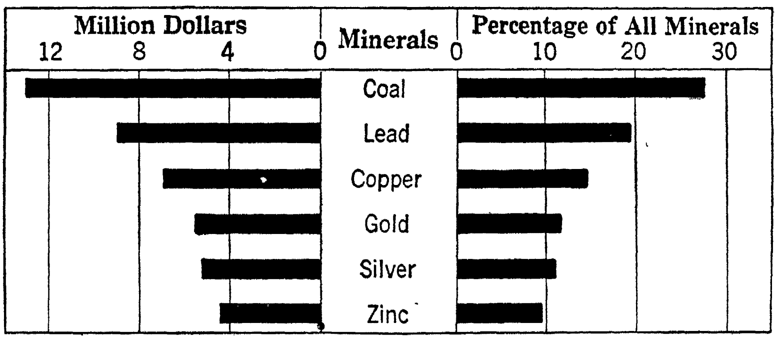


FIG. 276.—Principal Minerals of the Pacific Mountain Region. Average, 1922–1924.

Coal contributes nearly 28 per cent of the value of all minerals produced in the Pacific Mountain Region.

1890's. It is now carried on principally between the South Thompson River and the United States boundary for silver, lead, zinc, and copper, and on Vancouver Island and the neighboring mainland for coal and iron. The Pacific Mountain Region has come to be one of the world's greatest mining regions, although three-fifths is unprospected and no area is completely tested. The principal mining camps are along the southern boundary at Sullivan, Slocan, Rossland, Boundary, Copper Mountain; in the Klondike district; and along the coast at Britannia, Surf Inlet, Anyox, and Stewart. (Fig. 276.)

The region is noted for its production of coal, copper, gold, zinc, silver, and lead. The average annual production of minerals forms nearly a fourth of the total of Canada. The value of coal constitutes more than a quarter of the total mineral output of the region. British Columbia coal is the best steam and coking variety found on the Pacific Coast of the Americas, with the possible exception of Alaska, hence it

has great significance for domestic, manufacturing, and land and ocean transportation purposes. It has practically no competition in the market at the present time. The coal comes principally from Crow's Nest Pass near Fernie and the east coast of Vancouver Island. The actual coal reserve of British Columbia is about 17 per cent of the total reserve of Canada and varies from lignite to anthracite but is largely bituminous and anthracite. There are also considerable " probable " reserves in the Yukon. The southern field, and small areas on the Telkwa, Skeena, Nass, and Yukon Rivers are the only ones that have been examined. The leading copper district is at Anyox on Observatory Inlet. The northern section, or Yukon, produces gold, silver, lead, and a few hundred tons of coal. The total average value equals about $1,900,000, more than $1,250,000 being gold. With the large possibilities of finding minerals in the region, and with vast areas yet to be examined, it seems probable that the people will find the production of minerals one of the most profitable occupations for many years to come.

Fisheries.—The Pacific Coast, with its deep fiords and estuaries, and a sea ledge extending 50–100 miles from the coast, offers excellent feeding grounds for fish. Fishing was carried on in the region by the Hudson Bay Company before settlement began, but canning on a large scale started in 1873. To-day the fisheries of the region rank next to minerals, the average annual value being $20,000,000, or 46 per cent of that for the Dominion. The industry is built primarily upon the habits of the sockeye salmon. It spawns in British Columbia streams, particularly the Fraser River and its connecting lakes, and spends the first year of its life in these fresh waters. The following three years are spent in the ocean. It returns the fourth year to spawn, entering the rivers from June to September, the run being at its height from the last of July to the middle of August. The catch is made when the fish are entering these streams, as they die after spawning. Because of the life habits of the salmon, every fourth year usually produces a large catch. The sockeye salmon weighs 3–10 pounds and is noted for its fine quality and color. The quinnat is a much larger variety of salmon, weighing 18–30 pounds and occasionally 100 pounds. It enters the Fraser in the spring, and the run continues through July. The cohoe is about the same size as the sockeye and runs in the Fraser in September and October after the sockeye salmon run is over. The average annual value of the Pacific Coast salmon is more than twice that of cod. The salmon is the principal fish produced in Canada. (Figs. 255, 256.)

In entering the Fraser River the salmon pass through many miles of American waters where about two-thirds of the salmon catch is taken by American fishermen. This situation raises an international question

and a grave problem of conservation. The catch during the three years of minimum run depletes the supply and, since the fish spawn in Canadian streams only, conservation can be accomplished only by coöperation between the Canadian and the American Governments. Unfortunately, this coöperation has not yet been successfully carried out. The principal salmon centers are the Fraser River, Rivers Inlet, and the Skeena River.

In recent years attention has been directed to other fish, particularly the halibut. The principal halibut fisheries are on the banks of the Queen Charlotte Islands, from which the catch is taken to Prince Rupert and shipped frozen to the United States and eastern Canadian markets. Two whaling stations have been established on Vancouver Island, and two on Queen Charlotte Islands. The average annual catch is about 500 whales, which includes the sulphur bottom, finback, humpback, and occasionally the sperm whale. The northern or Yukon fisheries are small compared with those in the southern part of the region, amounting to about $13,500 annually. The chief foreign market for Pacific fisheries is the United States, where a large part of the catch is sold.

Agriculture.—Agriculture is a minor industry, owing to the rugged topography, the problem of clearing the land for crop production, and the greater immediate opportunities presented by lumbering, mining, and fishing. The first farming took place in the Fraser Lake district in 1811. The fur-trading companies were the early agricultural pioneers. The Hudson Bay Company had a large farm near Fort Vancouver as early as 1837, producing grain, vegetables, and other crops, and raising live stock. This company also had large farms at Cowlitz and Nisqually and smaller ones on Vancouver Island. The gold rush to the Cariboos in the 1850's and the establishment of mining camps supplied a market for agricultural produce, gave an impetus to farming, and accounted for the beginning of stock raising in the Nicola and Thompson valleys.

Though agriculture is a minor industry and confined to the south, the average value of field crops exceeds $18,400,000, and that of live stock $20,700,000. Hay and forage, potatoes, oats, and wheat are the leading crops, the first equaling nearly half the total value. Cattle make up two-thirds of the value of live stock and are produced for both meat and dairy purposes. The dairy industry has been growing in recent years, and the value of its products now exceeds $4,300,000.

A considerable portion of British Columbia has both soil and climate suitable for the growth of fruits. Especially is this true in the long southern interior valleys with mild winters, where fruit growing has

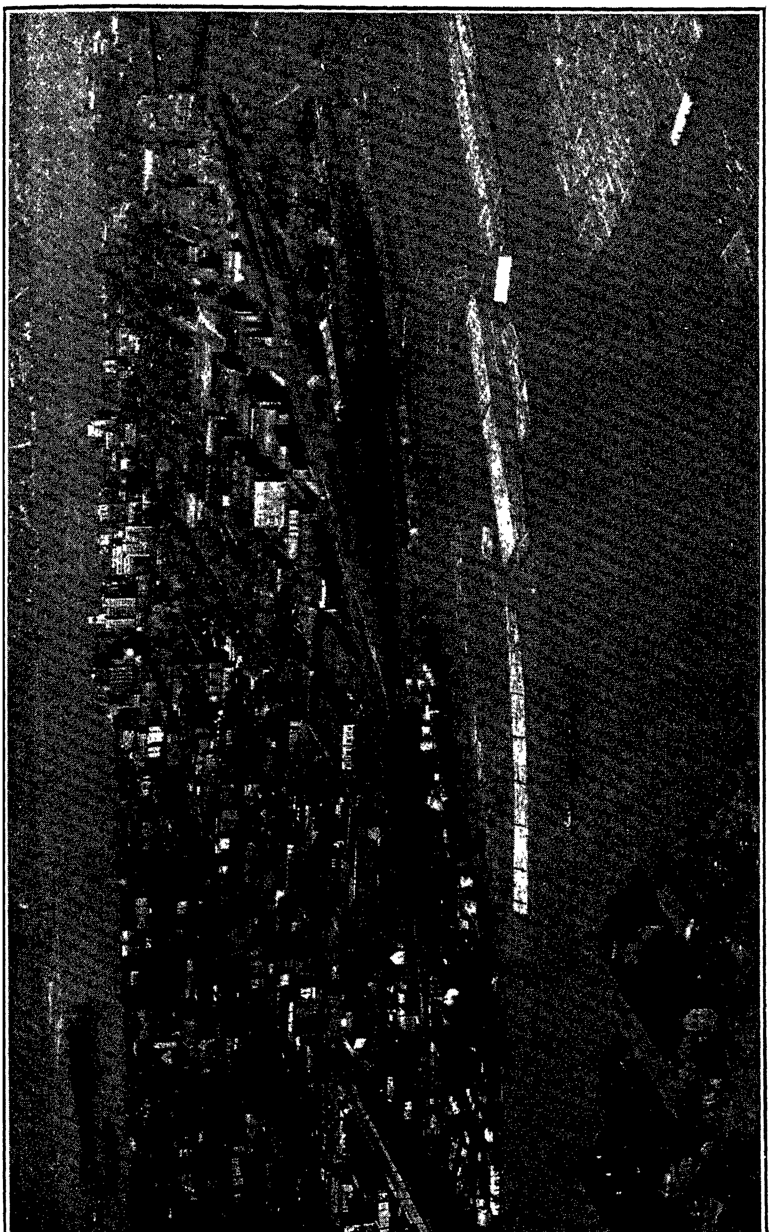
made rapid progress. The tree fruits include apples, pears, peaches, plums and apricots; and the small fruits include strawberries, currants, and raspberries. Apples are by far the most important fruit. The principal fruit regions are about Vancouver, Arrow Lake, and in the Okanagan Valley. There are undoubted possibilities for fruit growing in other areas as transportation facilities are developed and a labor supply is available.

Fur farming has made a start in this region, though at present it is small compared with the same industry on Prince Edward Island, and is carried on in both Yukon and British Columbia districts.

Owing to the mountainous and plateau character at the south, and the climatic limitations at the north, the land at present devoted to crops is only about 395,000 acres, nearly three-fifths of which produces hay and forage. The cultivated land is confined almost exclusively to the warm southern valleys, terraces, deltas, and flood plains. The farms, unlike those of other parts of Canada, are small, usually not more than 25 acres, and are cultivated intensively. The value per acre is correspondingly high, being nearly four times the average farm-land value of the Dominion and more than twice that of any other province. In addition to crop land, approximately 900,000 acres is used as range pasture. It is estimated that about 9 per cent of the British Columbia portion of the region is arable land and that a similar amount may be used for grazing purposes. However, it is highly improbable that more than a small fraction of this potential acreage will be utilized for many generations to come.

Cities.—All the large cities are along the southwestern mainland coast and the southeastern coast of Vancouver Island. Here are located Vancouver, Victoria, Vancouver South, New Westminster, Point Grey, Nanaimo, and numerous smaller cities. Prince Rupert, 500 miles north of this group, is the only other important coastal city. Near the southern border, along the railways, is a series of several minor cities among which may be mentioned Nelson, Kamloops, Fernie, and Vernon.

Vancouver is the most important and, with the exception of Winnipeg, the largest city west of the St. Lawrence Lowland. In 1880 its site was a wilderness. When the Canadian Pacific Railway selected it for a terminus, the growth was stimulated, and during the last twenty years its population has increased from 27,000 to 117,000. This is a remarkable growth when one considers that it faces the Pacific, with its back to the rest of the Dominion, and is separated from it by many miles of forested mountain country. It has a fine natural ice-free harbor capable of accommodating all shipping that it is ever likely to have; oceanic connections with the United States, Alaska, the Orient, Austra-



Courtesy Royal Canadian Air Force.

Fig. 277.—Vancouver, Canada's Principal Pacific Port.

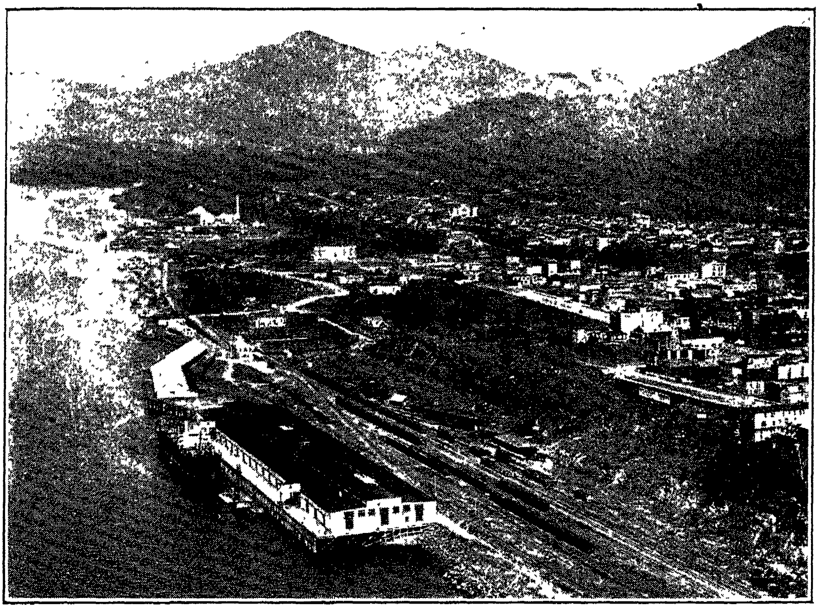
Huge log rafts may be seen floating in the harbor.

lasia, and Europe, by way of the Panama Canal; a near hinterland that contains most of the population of the region and produces agricultural crops, live stock, forest and mineral products. It is also economically accessible to the products and markets of the Prairie Plains; is near existing and probable future oceanic trade routes; is close to the populated centers of the United States and western Canada; is the entrepôt for British Columbia; is the center of the lumber industry; and is a manufacturing city. As the markets for the products of agriculture, forest, and mines are Atlantic and southern Pacific points, its geographical advantages are greater than those of any other more northerly Pacific port and seem to assure its prosperity as a commercial and industrial center. Its growth in recent years as a commercial port has been striking and it now ranks second to Montreal. During 1921–23 its imports from foreign lands increased 46 per cent, and its exports 193 per cent; during the five years ending with 1923 its lumber exports increased 550 per cent. The value of its foreign commerce in 1923 was nearly a third as large as that of Montreal; almost a third larger than that of St. John; nearly two and one-half times that of Halifax; and three and one-half times that of Quebec, Canada's other leading ports. With the exception of harbor superiority, the same factors affecting Vancouver may be said to apply to the neighboring towns in the district, including New Westminster.

The capital city, Victoria, situated on the southern end of Vancouver Island, is only one-third the size of Vancouver. It faces the state of Washington, whose mountains rise 7000 or 8000 feet from the sea, presenting a beautiful spectacle from the city. It was originally settled by British immigrants who came across the Isthmus of Central America and north along the coast by ship, and Victoria has retained much of its English appearance and spirit. Victoria's harbor is too shallow for the larger vessels, and its island location, separated from the mainland, limits its commercial and industrial development and possibilities. Only the southern end of Vancouver Island about Victoria may be considered as cleared and populated, the balance being a rugged, timber-clad highland.

Prince Rupert was established as a Pacific terminus of the Grand Trunk Railway system. Though smaller than several other cities it is of special interest because it is spoken of as the future rival of Vancouver. It is the terminus and shortest route from Eastern Canada to Oriental ports north of Shanghai, and has an excellent harbor with a wide, direct, and short entrance to the open ocean, and ample suitable space for the growth of a city. It is also nearest the best agricultural section of the western prairie, but the present transportation routes by way of Yellow-

head Pass make these sections nearer Vancouver and with better grades. Its hinterland for 150 miles inland is a rugged forest-covered area with small agricultural value as it is near the northern limit of cultivable crops. The trees are smaller, of less commercial value, and fewer to the acre than farther south, and the region is not known to be rich in minerals. Probably its best opportunity for import trade is the development of the fresh fish traffic from adjacent and Alaskan waters to the



Courtesy Royal Canadian Air Force.

FIG. 278.—The Water Front and City of Prince Rupert, British Columbia, the Western Terminus of the Grand Trunk Railroad (Canadian National).

markets of the United States and Canada. However, such trade is not likely to produce a large city. As its export trade is limited by the factors stated, it appears probable that the development of Prince Rupert will be slow and relatively unimportant.

PROBLEMS

1. The Pacific Mountain Region of Canada has possibilities for development as great as the Pacific States of the United States.

2. The Pacific Mountain Region offers more favorable and varied conditions as a permanent home for man than does the Prairie Plains Region.

3. Will the Pacific Mountain and Prairie Plains Regions, taken as a unit, become the most productive and most important portion of Canada?

4. Will Vancouver become the leading commercial and manufacturing city on the Pacific Coast of North America?

5. What will be the two leading industries of the Pacific Mountain Region?

6. Can the Pacific Mountain Region maintain a population greater than our Rocky Mountain and Plateau States?

7. The highest development of the Pacific Mountain Region can come only by the unrestricted admission of Oriental peoples.

8. Are the food-producing possibilities of the Pacific Mountain Region equal to those of Washington and Oregon?

CHAPTER XXVIII

MEXICO

SOME MAJOR CONSIDERATIONS

The Lack of Unity in the Geography of Mexico.—Nations, to be governed most effectively and economically, to have the currents of national life flow with serenity yet with force, should be natural geographic units or groups of closely knit units. Mexico is even more "disjointed" than Canada. The country consists mainly of a large tableland, called by some writers the Mexican Plateau, by others the Anahuac Plateau, on which nearly 58 per cent of the people live. This plateau is bordered by mountain barriers, the Sierra Madre Occidental, and Sierra Madre Oriental, which separate the plateau from coastal slopes on which live about a third of the population. Lower California and Yucatan are peninsulas, more closely associated with the United States, commercially at least, than with central Mexico, being separated from the populous parts of the country by either desert or tropical forests and by large bodies of water. Almost as isolated as the two peninsulas is the highland of Chiapas which lies to the east of the Isthmus of Tehuantepec.

These divisions of Mexico differ in altitude from low, flat plains, as in Yucatan, scarcely above the level of the ocean, to the 8000-foot plateau above which rise many peaks 15,000–17,000 feet in elevation. One may stand amid tropical plants on the Coastal plain at Vera Cruz and gaze on permanent fields of snow capping Mt. Orizaba but 75 miles distant. The annual rainfall varies from 150 or more inches to less than 10 in the far northwest. Mexico is, therefore, not only a land lacking in geographic unity; it is a land of extremes.

The Mexicans recognize three temperature zones or regions: *Tierra Caliente, Tierra Templada*, and *Tierra Fria*. The boundaries of these temperature regions are rather indefinite, and one finds *Caliente* enclaves at *Templada* altitudes, and *vice versa*. The *Caliente* region, in which the temperature rarely goes below 60° and ranges from that up to 105°, or even 110° in Vera Cruz, lies in general below 3000 feet. *Tierra Templada* lies approximately between 3000 and 6000 feet, being higher in the south than in the north; and *Tierra Fria* extends above 6000 feet, thus includ-

ing most of the plateau surface and the encircling highlands. *Tierra Heladas* is a fourth zone recognized by some Mexicans, this term being applied to the frozen lands on the higher parts of the ridges and peaks. Compare these regions with the temperature regions discussed in Chapter II.

In the seasonal distribution of rainfall, there is some uniformity in the various regions. The northwestern part of Mexico lies for the most part south of the sub-tropical, high-pressure area of the Pacific ,and except in the extreme northwest it is in the belt of the *Northeast Trades,* which in the American Mediterranean region blow from almost due east. Eastward-facing slopes, i.e., windward slopes, receive a good supply of rain, and lee slopes are comparatively dry. Summer is the rainy season in Mexico. The northward shifting of the equatorial belt of calms with doldrum rains brings rain on slope, plain, and plateau. But since the *Trades* are also blowing, more rain falls on eastward-facing slopes than on the level or nearly level areas.

In the matter of rainfall, the west coast presents a strong contrast to the east. In the former, as far south as 22°–24° N. the prevailing winds for the year are from the northwest, from the Pacific high, and, therefore, dry. This portion of Mexico is thus a continuation of the desert and semi-desert of southern California and Arizona.

South of 22°–24° N., southwest winds in summer, similar to the southwest *Monsoons* of India, move in to the low pressure over the plateau and give a light rainfall to the southwest-facing slopes of the Sierra del Sur and the Mexican Plateau. The surface of the great plateau of Mexico, bordered on the east, south, and west by higher lands, thus has only a meager rain supply. At Mexico City the year's supply is only about 25 inches, falling mostly between May and October, inclusive; and at the northern border of the country the precipitation is only 8–10 inches, with the rainy season mainly in July, August, and September. The northern and northwestern parts of Mexico have not only the lowest rainfall but also the shortest rainy season. Most of Mexico north of 22°–24° N. has less than 20 inches of rainfall, and about a third of this area has less than 10 inches.

On the moist lowlands of the *Tierra Caliente*, conditions are suitable for tropical forests and the production of tropical crops. Humid temperate zone forests and crops may be grown on the coastal slopes of the plateau, on the slopes of the mountain ranges, and on the plateau itself where water is available either from rain or through irrigation. Over a large part of Mexico, in the semi-arid section, the pastoral industry will ever dominate man's economy.

The lack of unity in climate, natural vegetation, and crops would

make for strength in some countries, inasmuch as some regions or groups are complementary to others (the arid are complements of the humid; the highlands, of the lowlands; the temperate, of the tropical) but the isolation of the various parts, the result of topography or location, prevents the country from reaping the advantages of these complementary conditions.

The Great Importance of Railroads in Unifying Mexico.—In Canada, many miles of railroads have bound together into a fairly unified nation the far-flung geographic units. But in Mexico only the plateau and east

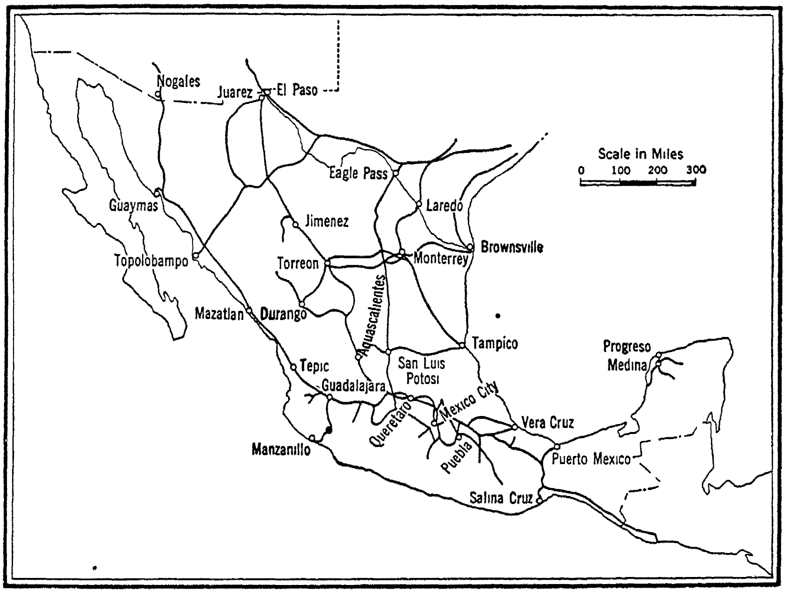


FIG. 279.—The Important Railroads of Mexico.
Mexico City is the most important railroad center of the country.

coast, including the Isthmus of Tehuantepec, have been connected by railroads. There are no large rivers in Mexico, like the Ohio, Mississippi, or Missouri in the United States, that lend themselves to commerce. Most of the rivers are short and have numerous rapids or falls. Only the lower courses are navigable, and these do not have close commercial contact with the sea, for their mouths are nearly closed by bars. All experience great fluctuations in depth and flow. The railroad is, therefore, all-important in Mexico as in Canada in holding together the various geographic regions. (Fig. 279.)

Railroad construction meets with great engineering difficulties, particularly within and on the borders of the Central Plateau on which

Mexico City is located. In passing from one basin to another 4000–5000 feet above the sea, the railroads are in many cases forced to ascend to altitudes of 8000 feet or more. So difficult was it to reach the Central Plateau from the coast (political conditions also involved) that the City of Mexico had no railroad connection with Vera Cruz until 1873; and the road to reach the capital ascends 8200 feet.

Mexico City is the logical railroad center of the country and will, in time, when the face of the land is covered with a close network of rails, have close contact with all parts; but at present much of the

FIG. 280.—Natural Regions of Mexico.

northern part of the country is commercially tributary to the United States, for many railroad lines cross the northern border at Brownsville, Laredo, Eagle Pass, El Paso, Nogales, and Presidio. Along these routes the reader is asked, in the following pages, to make hurried journeys in an endeavor to learn something of the country and its divisions. (Fig. 280.)

THE MAJOR REGIONS OF MEXICO

Lower California.—Lower California (Baja), separated from the main part of Mexico by desert lands and a gulf, is, from a commercial and economic standpoint, a part of California. The delta lands of the Colorado are being developed mainly by American capital for the raising

of long-staple cotton, alfalfa, and barley. Many of the enterprises are managed from the American side of the boundary, and the products find their chief market in the United States. The non-irrigated lands are owned by Mexican cattle owners, and, but for the enterprise of the Americans in developing irrigation, all the lands would be devoted to grazing. Outside of the irrigated areas of the Colorado delta, agriculture is next to impossible over the entire peninsula of Lower California, an area larger than that of Tennessee, except in some small river valley watered by streams from the range that forms the axis of the peninsula. In the 750-mile journey to the southern tip of the peninsula, a journey replete with hardship and delays, for there are few highways, one views a series of landscapes of barren hills, desert plains, and rocky mountains, with here and there an irrigated valley. The upper slopes of the mountains are clad with thin forests of oak and pine. Wheat is grown in some of the northern valleys by Russian colonists; and in the far south Chinese gardeners and horticulturists, only a few hundred in number in all, raise vegetables and sub-tropical and tropical fruits. About 80 per cent of the people live in the southern portion of the peninsula, chiefly because of the greater rainfall, in this section.

Yet Lower California is not without resources which, if developed, would support a population many times the present 62,000 (in 1921) people. There are some timber on the mountain slopes, economically inaccessible at present, and valuable fisheries of pearl shells and edible fish. The interior, only partially explored geologically, is known to contain rich deposits of copper, silver, lead, zinc, and gold, and immense amounts of iron ore. The most productive copper mine, about the only mineral development in the peninsula, is owned by a French company at Santa Rosalie, which not only mines the ore but smelts it. Development of these mineral and forest resources awaits better transportation facilities. The coastwise traffic is now mostly in the hands of Americans. American merchants on the Pacific Coast furnish most of the imports of machinery, mine supplies, groceries, dry goods, gasoline, and kerosene; and a railroad, should one be built to penetrate far into the peninsula, must naturally come from the United States. Lower California is, therefore, bound to be absorbed by the great Republic on the north, if not politically (several advances have been made toward its purchase), then commercially, and the latter has already been accomplished to a large extent.

The Northwestern Slope.—From Tucson the traveler may penetrate 800 miles into the Sonoran region of Mexico along the Southern Railway of Mexico, to Guaymas, past Mazatlan, on toward Tepic; and in the near future, undoubtedly on to Guadalajara and Mexico City.

From Nogales to Guaymas, one traverses an arid and semi-arid region. Only the larger mountain streams reach the coast, because of excessive evaporation or sink-in. Agriculture is possible only through irrigation; but there is a fair supply of water for crops, for the drainage areas of the larger streams are extensive and the rainfall on the mountains is 30 inches or more. Only a few irrigation sites have been developed, largely through lack of enterprise, but also because of isolation from good markets. Guaymas, although little more than a village, is the port for this state. Far back in the sixties of the last century, it had prospects of being of considerable commercial importance, being the Pacific terminus of one of the projected transcontinental lines of the United States. The Kansas City, Mexico, and Orient Railroad, now nearly completed from Kansas City to the Gulf of California, is the present realization of the dream of a half century ago, but its port is Popolobampo, not Guaymas.

To the south of Guaymas, conditions similar to those of the state of Sonora prevail, although the rivers carry more water than those farther north, the result of higher mountains and heavier rainfall in the mountain areas and on the coastal plain. There are many very prosperous irrigated areas on the several broad flood plains.

In the Fuerte Valley some companies have developed excellent sugar plantations, with their own modern-equipped centrals or factories. There can be little hope for success, however, in the production of crops that must compete with those raised in the southern and southwestern United States as long as they must surmount a protective tariff barrier at the international boundary. Yet, except for this, there are excellent opportunities for future expansion. The principal crops are chick peas, wheat, and rice. The culture of rice is being developed on a large scale. Chick peas, most of which are exported to Spain, are an important crop.

Grazing is the dominant industry at present in these states. In the past, their fame rested on their mineral deposits, and the same will undoubtedly be true in the future. Indeed, it is claimed by some writers that this region is the richest in minerals in the world. Its gold helped fill the coffers of Spain even in the early Colonial period. The traveler in regions distant from the railroad will find many old workings and tailings along the streams leading out of the canyons, some a thousand feet deep, that pierce the lofty Western Sierra even to the old rocks that form the core of the Plateau of Mexico. These old rocks over most of the plateau, enriched by volcanic intrusions which brought deposits of gold, silver, copper, and lead, are buried deep by lava intrusions and riverine and lacustrine deposits, and are most easily reached at the edges

of the plateau in these "shafts" carved by nature. This region is the Mexican Eldorado for American capitalists interested in the exploitation of precious and semiprecious deposits; but the difficulty of transportation to the seacoast, or even to the railroad near the coast in the last few decades, has greatly reduced the profits and resulted in wasteful mining and smelting, the baser metals often being neglected. Gold, silver, and copper crushers and smelters are located near the workings, the "pigs" or bars being packed by mules or burros, 100 miles or more in many cases, to the railroad. Besides the metallic minerals, graphite of an excellent quality is mined near La Colorado, Sonora. Oil is known to be present in great quantities, and prospecting has hardly begun. The extensive beds of anthracite in Sonora, including some seams 12 or more feet thick, are pierced by only a few mines.

The Mexican Plateau and its Divisions.—From El Paso or Juarez the Mexican Central Railroad carries the traveler over the great Plateau of Mexico, down a grand avenue, bordered by the western and eastern Sierras, 900 or more miles long, to Mexico City. The plateau near the northern border is some 300 miles wide but narrows toward the south, for the two Sierras in their southward extension approach each other and end in a wild scramble of volcanic mountains, basins, deep gorges, and high ridges. This southern portion of the Mexican Plateau is known by some as the Junta, or juncture. We shall call it the Central Plateau, and that to the north the Northern Plateau. The Central Plateau has an average elevation of about 8000 feet; but the surface of the Northern Plateau along the northern border lies only about 4000 feet above sea level.

The Northern Plateau.—The surface of the plateau is strikingly flat; although it is not a plain, the topography is subdued, with many filled basins and broad waste slopes. The bed rock is composed mostly of lava sheets laid down on old crystalline rocks. The lavas, extending over vast areas, exuded from numerous crevices, buried the old surface for the most part; but here and there the upper portions of the ancient ridges protrude. Sedimentary rocks occur in places and indicate a time when a part of the plateau lay beneath the level of the sea. Much of the bed rock of the plateau is mantled by eolian, alluvial, and lacustrine deposits; the soils derived from these need only water to yield abundant crops.

The surface of the Northern Plateau is poorly drained, in fact, most of the great plateau has interior drainage. The water that falls on the slopes of the mountains flows into basins, many of which contain vast lakes in the rainy season but dry up to broad stretches of mud, salt, and alkali in the dry season. These playas and salinas are numbered by

the hundreds, but only a few are large enough to be represented on our small-scale maps. Three of the largest of these lakes lie in the vicinity of Torreon, and are fed by the rivers Nazas and Aguanaval, some of the water from which, in the rainy season, is diverted to vast fields of cotton. The total production is about 100,000 bales, enough to meet the demands of the cotton mills of Mexico. The Nazas, about 370 miles long, is called the Mexican Nile, and the lake district the Laguna. (Fig. 281.)

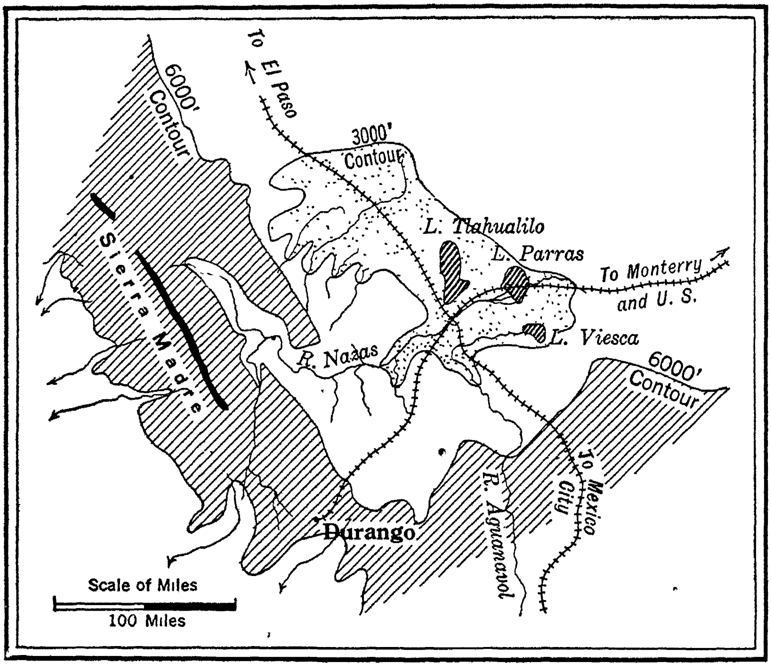


FIG. 281.—The Laguna Region on the Northern Plateau of Mexico.

This basin is in many respects like the Carson Sink in western Nevada. The lakes vary greatly in height during the year. Irrigated lands bordering the streams produce a good quantity of cotton.

The traveler finds in the northern part of the Northern Plateau physical conditions similar to those that prevail in western Texas and southern New Mexico; yet what a contrast in the human occupants of the environment! In crossing the Rio Grande one passes into a truly foreign country. The enterprise, progress, and aggressiveness that characterize the people of the United States are left behind. From the twentieth century, in which man has gone a long way toward conquering nature, one plunges into a land where man is only in the beginning of his

cultural development. The difference lies not in the physical environment but chiefly in the difference in race and government. There are untold treasures of mineral wealth beneath the surface in Mexico, and some of these deposits have been exploited for centuries; yet these riches have gone to enrich the few, while the vast majority of the people have remained in poverty and ignorance, unacquainted with the great progress that is being made in other parts of the Americas, in Europe, and the distant continents.

Aridity finds its response in a landscape that is characterized by scattered bits of vegetation and brightly colored soils and rocks; in adobe huts and pretentious whitewashed dwellings of mud and clay; in frequent insurrections led by " generals " each with a few hundred half-starved, lawless, nomadic followers; and in large estates. The chief wealth of the plateau, as previously stated, lies in the immense mineral resources that have for centuries been exploited and yet, relatively speaking, have hardly been touched. Gold and silver are widely distributed and are mined in about all the states of the Mexican Plateau. There are known deposits of copper, tin, cinnabar, and sulphur. The bituminous coal field of the state of Coahuila, an extension of the lignite field of Texas, are actively worked near the Sabinas River. This is the only field actively worked in Mexico, and from it comes nearly all the coal consumed in the country. The annual output in times of peace is about 700,000–900,000 tons. Near Durango is a famous hill of iron ore, Cerro de Mercado (640 feet high, 1100 feet wide, and 4800 feet long) which contains, it is estimated, 460,000,000 tons of high-grade ore. There are many metallurgical works, smelters, and reduction plants for the preparation of metals for export in the several cities of the plateau. Monterey has a large iron and steel plant, and two iron and brass foundries. Although there are possibilities of much greater pastoral and agricultural development, one must not overestimate the soil resources, for aridity is greater here than in parts of the United States where the rainfall is the same, because evaporation is greater. Besides the cotton of the Laguna, wheat, corn, ixtle fiber, and maguey are the chief crops.

The Hacienda, a Feudal State.—American capital has invaded the Mexican Plateau, and particularly the Northern Plateau, being invested in mines, forests, and haciendas. However, most of the immense landed estates, many measuring more than a million acres and some more than two million, are in the hands of Spanish creoles whose ancestors secured their titles directly from the Spanish Crown. These estates, or *haciendas*, are feudal in their social, political, and economic organization. The center of life and authority is the dwelling house of the *haciendado*, or owner. The owner may be

absent most of the time in the capital of the state or the nation, for the majority of the politicians and statesmen of Mexico are *haciendadoes*; in that case the authority descends to the overseer. Most of the manor houses are lacking in architectural merit, yet, with their barred windows and massive doors and thick stone or mud walls, they present a romantic appearance. Some of them, in the early centuries before the nomadic Indians were tamed, withstood many a siege. Scattered here and there over the immense haciendas, are the villages of adobe huts of the peon workers, the sites of these villages, like the site of the manor house, being determined in most cases by a spring or other source of water supply. On many of the large haciendas there may be from five hundred to two thousand people. Most of each estate is pasture land on which herds of mongrel cattle feed, attended by cowboys, the most picturesque features of their equipment being their broad-brimmed, high-crowned hats, long lassoes, and tough Mexican ponies with their silver-decorated saddles. Where water is to be had in large quantities, irrigation is possible, and from many strong springs or from rivers, where topographic conditions permit, long irrigation ditches carry water to fields of grain, gardens, vineyards, and orchards of fig, pomegranate, avocado, and quince.

Each hacienda is a social and economic unit, nearly all the needs of the dwellers, except those of the *haciendado* and his family, being supplied from the estate. The system of agriculture is primitive. The chief implements are a wooden plow, a hoe, a sickle, and a cart with heavy, solid wheels. The threshing is done in most parts, in the Biblical way, by the treading of cattle. Fibers, locally grown, furnish raw materials for hats and clothing. As in feudal days in Europe, the peon for the most part belongs to the *hacienda*. Some peons leave to become vagrants. Most of them are kept in debt to the owners of the estates, the debt passing from one generation to the next. Some of the peons are intelligent and ambitious, but most are indifferent to their lot.

The Constitution of 1917 provided for the breaking up of these estates and their sale to Mexican citizens in small units. The fulfillment of the promise to the landless peons began in the Obregon administration and has been actively pursued since. Each state government is to decide what area each landowner may hold. If he neglects to dispose of the excess, the government confiscates the land, divides it into smaller farms, contracts with the peons to purchase the tracts, and issues bonds to the former owner.

The Gulf Coast.—The Northern Plateau is readily accessible by rail from the northeastern border, as well as from the Gulf Coast. In northeastern Mexico the mountain border of the plateau breaks down to the north of Saltillo, and railroads crossing the lower courses of the

Rio Grande reach the plateau cities by easy grades. From Tampico, the great oil-exporting port, railways extend to Monterey, San Luis Potosi, and other cities.

Vera Cruz, Puerto Mexico, Tuxpan, and Tampico lie on the eastern edge of the narrow Gulf Coastal Plain, which is a continuation of the Coastal Plain of the United States, and, like this plain, is composed chiefly of sands and bordered on the east by lagoons and barrier beaches. It is crossed by numerous rivers that descend from the steep eastern slopes of the plateau. In their lower courses the rivers are, for the most part, aggrading streams. The Coastal Plain is well watered, the rainfall being heavier in the south than in the north. From Tampico southward the lowlands are tropical in temperature and in vegetation. Forests rich in cabinet woods, dye woods, gum trees, and medicinal plants have here and there been invaded and removed to make way for plantations of sugar, rubber, bananas, rice, and other tropical crops. Although there are great possibilities for future agricultural development, little has yet been done. The Gulf Coast from the Isthmus of Tehuantepec northward contains only about 8 per cent of the people of Mexico. The deep valleys that have been carved in the eastern border of the Mexican Plateau are veritable Edens in the luxuriance of their tropical and sub-tropical vegetation and crops. Here there is an abundance of moisture, for not only is the rainfall heavy but the copious streams furnish water for irrigation.

Yucatan Peninsula.—Yucatan Peninsula, also tropical in temperature, is even less populous than that portion of the Gulf Coastal Plain just discussed. About $3\frac{1}{2}$ per cent of the people of the country live in the peninsula. The density of population of the state of Yucatan, the most populous part of the peninsula, is only about nine to the square mile.

Yucatan Peninsula is the "Florida" of Mexico in its geologic structure and origin. It is a low, flat calcareous plain, practically without rivers, the excess water finding the sea through underground channels. As in parts of Florida, there are numerous sinks and caverns, some 100 feet or more in depth. These caverns are the source of water supply for the people over a large part of the peninsula, and for that reason the small settlements are often found near these caverns or open sinks.

The drying winds of the *Trades* (practically all the rain comes from the occasional tropical cyclone) restrict the vegetation to a scanty growth in the north, but this vegetation increases in size and density toward the south. Near the base of the peninsula where the rainfall is heavier, there are tropical forests of great density with the characteristic epiphytes, lianes, and the broad-leaved evergreens. Most of the peninsula outside the forest is given over to grazing, but in northern

Yucatan henequen, or sisal, is the leading crop. This part of the peninsula is closely knit commercially with the United States, for sisal is in great demand in the grain fields of America.

The economic life of most of the people of northern Yucatan is built upon the sisal industry: the growing of the plant, the extraction of the fiber, its transportation, and its shipment. The bulk of the freight carried by the numerous railroads is sisal, and the hundreds of miles of tramways transport the long, fleshy leaves from the fields, where the plant is grown in rows that stretch for long distances across the low, rolling or hummocky plains, to the railway stations from which it is taken to the factories. Merida is the political and commercial center of the State of Yucatan, but Progreso is the only important port. There is no harbor at Progreso, for the whole coastline, like the eastern coast of

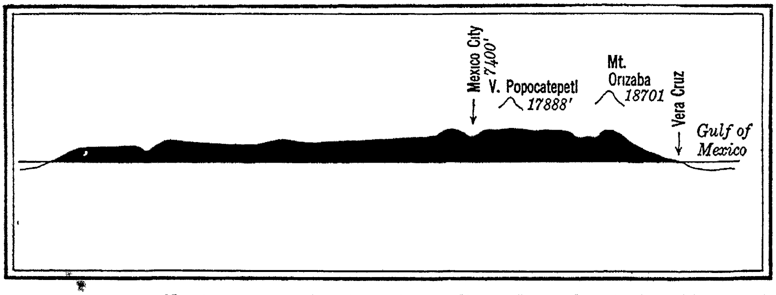
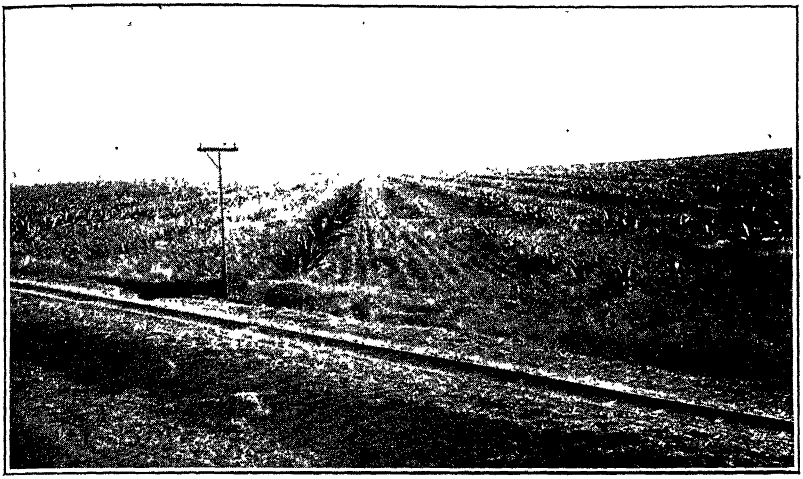


FIG. 282.—A Profile Across Mexico from Vera Cruz through Mexico City to the Pacific. Vertical scale about twenty times the horizontal.

The high altitude of the Central Plateau insures moderate temperatures even though it is in tropical latitude.

Florida, is bordered by lagoons, barrier islands, and shallow water. Ships receive and discharge cargoes from lighters.

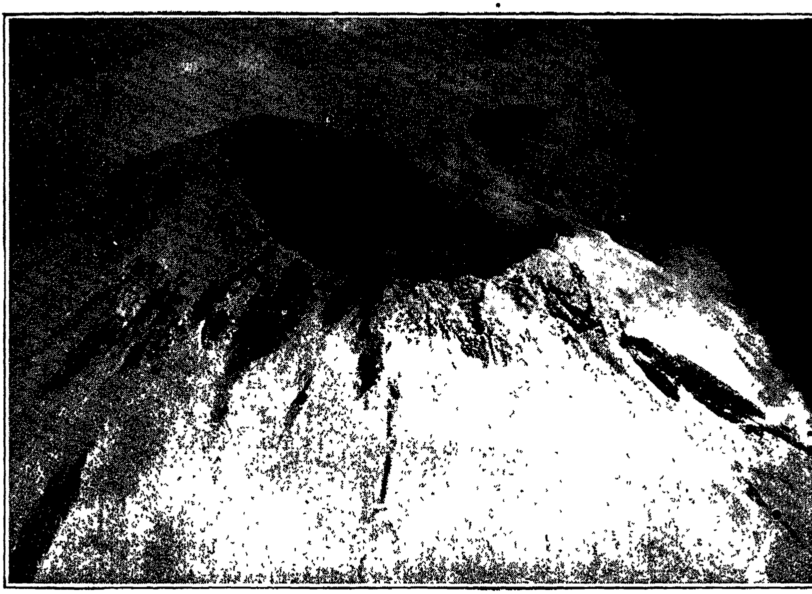
The Central Plateau.—Vera Cruz is the port most commonly used by travelers to reach the Central Plateau, the most densely populated part of Mexico. Here live about 40 per cent of the people of Mexico, although the area is about 10 per cent of the total of the country. Here are the most populous cities of the country and the most populous states. The states are smaller than in other parts of Mexico, and the land holdings smaller. This is the most attractive part of Mexico from the standpoint of temperature. (Fig. 282.) While the rainfall is not so great as farther south, it comes in the summer and is sufficient for many sorts of warm temperate crops. There is likewise sufficient rain for large rivers to develop, such as the Santiago, Balsas, and Pinuco. The Rio Santiago has in its middle course the largest lake of Mexico, Lake Chapala, 70 miles long and 20 miles wide in places. These rivers have cut deep gorges on



Courtesy W. H. Haas.

FIG. 283.—Maguey Grown for Sisal in San Luis Potosi.

There are several species of agave that produce fiber. Henequin is grown in Yucatan. Next to Manila hemp the sisal fiber of Mexico is the strongest coarse fiber produced for commerce.



Courtesy Clara Brignac.

FIG. 284.—The Crater of Popocatepetl, Snow Clad and Shrouded in Clouds.

The name is Aztec for "Smoking Mountain." The volcano is constantly sending out steam and at times cinders. Its last violent eruption was in 1740. It lies 40 miles from Mexico City, from which it is readily seen through the rare, generally clear air over the plateau.

tables, maguey (Fig. 283), and cereals, and in the basins and valleys the irrigated lands are given over to corn, sugar cane, and tobacco. Coffee is grown on the well-drained slopes. Pasture lands are widespread.

The Central Plateau is chiefly of volcanic origin, although diastrophism has undoubtedly been active. (Fig. 284.) Vulcanism on a grand scale has taken place even within the last two or three thousand years. Recent archæological discoveries near Mexico City have revealed a "Mexican Pompeii" buried in volcanic mud and ashes. Gases are still exuding from some of the volcanic mountains, and bare scoriaceous lava fields exist in some parts.

Mexico City is the crowning glory of the cities of the country, and in some respects vies with and even surpasses the cities of Anglo-Saxon America. Like other Hispanic capitals, it has numerous expensive government buildings and wonderful cathedrals, characterized by beautiful architectural lines, maze of detail, and solidity of structure. The city lies in a beautiful basin some 40 miles long and 30 wide, which contains six withering lakes. In pre-Columbian days the city was on an island, connected to the mainland by a causeway, and all the lakes of the basin were larger. (Figs. 285 and 286.) In the conquest of the city in 1522, Cortez destroyed every block of buildings; but in the rebuilding the Aztec plan of the city was followed, the causeway became a roadway, the center of the ancient city became the plaza, and a huge cathedral was built on the site of the temple where human sacrifices had once been offered by the hundreds and thousands.

Courtesy of W. H. Haas

FIG. 286.—Cattle Grazing on the Old Bed of Lake Texcoco. This was the last of the lakes of the Mexico City basin to be drained.

The capital is the center of Mexican civilization in all its aspects. To haciendadoes from all parts of the country, it is a political and social center. Its shops contain goods from every manufacturing country in

Europe, as well as from the United States. It is the most cosmopolitan of Mexican cities. Its numerous ecclesiastical buildings and temples and institutions of learning make it a great religious and educational center. If its influence fails to be felt in the most isolated part of the country, it is because of the great physical barriers. (Fig. 287.)

2) **The Southwest Pacific Slope.**—The Pacific slope, from 20° N. to the Isthmus, varies in climatic conditions, natural vegetation, and crops, as does the eastern slope from Vera Cruz to the Central Plateau. The Pacific Coast plain zone is much narrower than the Gulf plain; the **Always Hot** area is, therefore, narrow, yet in this 700-mile strip there are valuable forests of cedar, mahogany, and other woods, for this

Courtesy of W H. Haas.

FIG. 287.—Selling Charcoal in Mexico City.

In the **Always Mild** temperature region in which Mexico City is located, people demand little artificial heat in their houses. Charcoal is used mostly in cooking.

section is well watered. Plantations growing sugar cane, cacao, coconuts, tobacco, rubber, rice, fruits, and fiber, although widely scattered, indicate the possibilities of the section in tropical agriculture. At higher altitudes the vegetation and crops approach in character those of the Central Plateau. The irrigated valleys are particularly productive. Agriculture is the chief reliance of the people, although there is much grazing, timber cutting, and mining. Immense deposits of minerals are known to exist, and scientific exploration has hardly begun. The inaccessibility of this section from the Central Plateau and the dense vegetation are undoubtedly reasons for the world's knowing so little of the mineral resources here. The entire slope will have a great future when it becomes more densely settled and more railroads are provided. In the lowlands of Mexico, however, the Indian is of the lowest order of peon. He is lazy, shiftless, dirty, and improvident. Life is easy. nature has never disciplined him in persistent labor. What a country

this would be if settled by hardy, thrifty farmers like those from northern Italy!

The Highland of Chiapas.—The highland of Chiapas, above tropical plains on either side, is, because of its altitude, about as well suited for a higher cultural development as the Central Plateau, and perhaps even better, for it has a more copious supply of rain. The density of population at present is about thirteen to the square mile. Its greatest needs are people, roads, and railroads, and with these it has a great future. The savannas are natural grazing grounds; the valleys may be irrigated; and the bordering tropical forests are as rich as any in the country.

(See page 555 for Questions, Exercises, and Problems.)

CHAPTER XXIX

MEXICO AMONG THE NATIONS OF THE WORLD

Area and Population.—The great powers of the world are not necessarily the largest in square miles and number of people, yet in determining the rank of a country area and population must certainly receive consideration.

The Spanish possessions in North America once bordered the Gulf and the Caribbean on their north and west and included much of North America westward from the Mississippi. The Pacific Coast from 42° N. to the Isthmus of Panama was Spanish, and Spain held a hazy claim even to parts of the Alaskan Pacific littoral. The Mexico that won its independence from Spain in the early part of the nineteenth century included only a part of this vast domain; yet, for about two decades, it was among the six or seven great countries of the world in area. The loss of the northern territories to the United States and the secession of Guatemala reduced the area to 767,000 square miles. It is still among the nine leading nations in surface extent. It is seventy times as large as Belgium, seven times as large as Italy, about three times as large as France, and has more than six times the area of the United Kingdom, including Ireland.

As in most of the countries of the New World, its population is only a small part of what it can really support. The average density is only about 20 per square mile, and the total population a little more than 15,000,000. This, however, is nearly twice the population of Argentina or Canada, two and one-half times that of Sweden, and three times that of Australia. With the exception of Brazil, Mexico, is the most populous of the Latin American countries of the New World. On the basis of area and population, therefore, Mexico ranks well among the nations of the world.

In spite of this apparent high ranking, Mexico at present is classed by most students among the minor nations, undoubtedly considerably below the A. B. C. countries of South America. Peru, Colombia, Cuba, and others no doubt stand higher in international good will and respect than does Mexico.

Antiquity of Mexico.—Some nations, like some individuals, claim recognition and homage because of the traditions and history that lie

behind them. Surely Mexico should rank high in this respect. Archæological investigations in Mexico in recent years have convinced scientists that a people sufficiently advanced in their cultural development to construct great rough stone pyramids 100 feet high lived in the Valley of Mexico at least three thousand years ago. Their implements were very crude, consisting of flaked or chipped knives, bones and scrapers, and roughly shaped pottery. These discoveries push American history back many centuries. Neither archæology nor history has yet been able to fix the date of man's coming to Mexico. As far as tradition goes, the country was always inhabited. Certainly, the southern part of the Mexican Plateau had been the center of an advanced civilization for many centuries before the Spanish came, and this civilization developed under conditions very similar to those of Egypt, Mesopotamia, and Central Asia, namely, isolation, limited area, healthfulness, high fertility of the soil, and irrigation.

Legend and tradition fix the sixth century, A.D., as the time when a group of Nahuas arrived in central Mexico. Toward the close of the seventh century a band of Toltecs, possibly descendants of this Nahua group, formed a settlement, the ruins of which are now known as Tula, about 50 miles north of Mexico City. These early invaders were replaced by other tribes, yet Tula civilization dominated a large part of the plateau until the second half of the eleventh century. Some time after the year A.D. 1300, the Aztecs, also a branch of the Nahuas, appeared in the Valley of Mexico, looking for a "Promised Land" of which their deity had told them. They settled at many points in the valley, but about 1325 established themselves on an island amid the waters of Lake Texcoco. The insular position of the city gave its inhabitants protection.

The city grew rapidly; the Aztecs became powerful and expanded the frontiers of their country. Yet they were not the only people of advanced civilization that filled Mexico with ruins of palaces, temples, pyramids, and tombs that are now the wonder of the modern world. The Mayan tradition fixes the third century, A.D., as the time when this great tribe moved southward into Yucatan, a date even earlier than that of the genesis of the Toltecs and Aztecs. Archæology has much yet to decipher of the ancient civilization of Mexico. Evidences of its high development are numerous. The Toltecs worked in silver and gold, wove cotton, made pottery, cut stone, erected wonderful buildings, and on their walls left records in the form of picture writing. The splendor of the Aztec City of Mexico, which was the wonder of the conquering Spaniards, hardly surpassed the center of Toltec civilization.

The Aztecs left their records in hieroglyphics. In their primitive

form of writing they drew maps of their country, left genealogies, and published their laws. They had a calendar of eighteen months of twenty days each, with additional days each year. Leap years were allowed to accumulate, and every fifty-two years twelve to fourteen days were added to the regular year. Among their artisans there were potters, paper makers, masons, and workers in metals. Placer deposits were worked, and silver was separated from the ore by chemical means. Gold was also separated by the amalgamation process. Cloth was made from cotton, palm, and cactus, and decorated with feathers. The Aztecs had aqueducts, reservoirs, suspension bridges, fortifications, and embankments. The glory of ancient Mexico is hardly less lustrous than that of ancient Egypt.

Mexico under Spain.—As a Spanish colony, Mexico was one of the choicest of the New World possessions, and vied with Peru in yielding wealth to the Spanish Crown and court favorites.

The Spanish régime was fruitful in many respects. The first printing press in America was set up in Mexico about 1540. The second university founded in America was established in Mexico City about this time. The foundations of the Cathedral of Mexico, the beautiful structure still to be seen in the capital, were laid about 1575, and church architecture of this period has hardly been surpassed in America.

Attempts were made about this time to improve the health conditions of Mexico City by the excavation of a canal across the rim of the basin. The church founded missions, and nobles and priests united in uplifting the natives. Often their efforts were of little avail, for at times and in some parts slavery of the most brutal sort prevailed. Many of the Spanish creoles of Colonial days were wealthy and contributed much to the culture of the world.

Mexico under Diaz.—For more than half a century after the War of Independence, internal strife brought the fortunes of Mexico to a low ebb, to be rehabilitated under the masterful control of the dictator Diaz who ruled Mexico wisely, and for the most part beneficently, from 1876 to 1911, with the exception of four years. No other country ever made greater progress in the same period of time than did Mexico during these thirty years. Diaz kept order throughout the whole land; foreigners could travel in safety anywhere. Mexican credit was good with any lending nation, for he put the finances of his country on a firm basis. Harbor works were provided. Diaz also formulated a far-reaching scheme to cover the land with a modern system of transportation and to that end increased the railway mileage during his régime from 367 miles to 15,000. At the time of his resignation there were nearly 40,000 miles of

telegraph lines, 850 miles of Federal telephone lines, 6 wireless offices, and 2974 post offices. Nearly 3000 vessels entered, and about the same number cleared, the ports of Mexico each year. Agriculture was prosperous, mines and factories busy, the banks were solvent, and hundreds of millions of dollars of foreign capital were invested in Mexican enterprises. Encouragement was given to schools and colleges. The rule of Diaz showed the world what a strong government can do in giving Mexico a relatively high place among the nations of the world.

The Resources of Mexico.—The resources of the different divisions, or regions, of Mexico have been pointed out. Let us here summarize these assets, that we may better see how Mexico ranks among the other nations in the material basis of progress and well-being.

Forest Lands.—The " forest " lands of Mexico cover some 44,000,000 acres, of which about 25,000,000 acres are timber lands, and have a wide variety of woods, as we have seen. The tropical forests bordering the coasts, from which come rubber, gums, and lumber, can be the more easily exploited because of easier access, but these have been invaded by the timber cutter only here and there. Lumbering here as in most tropical regions is difficult, for the timber trees do not grow in close stands; non-commercial trees and vines and undergrowth interfere; the ground is often soft, making the use of wheeled vehicles difficult; and the logs have a high specific gravity, so that they are rafted only with difficulty. The wet tropical forests of Yucatan and elsewhere must wait the building of railroads; and the temperate zone forests of the slopes of the interior mountains likewise will long be conserved because of their isolation, except those about mining properties which call for mine timbers. In spite of the difficulty of lumbering, the forest resources of the country are great and will be of greater value in the timberless age that is fast coming in the United States and Europe. Importation into the United States has already begun.

Agricultural Lands.—The extent of potential agricultural lands is difficult to estimate, for man in Mexico is just at the beginning of his evolution in land utilization. To what extent irrigation, dry farming, new crops, and scientific practices will expand the agricultural frontiers is impossible to determine. Some authorities state that there are about 30,000,000 acres of cultivated land, or about 50,000 square miles, an area equivalent to that of the state of Alabama. This is only about 6 per cent of the total area of the country. Aridity exerts its retarding and withering influence on agricultural progress in a large part of the country; yet, if Mexico will but profit from the example set by the two English-speaking countries to the north in their conquest of arid lands, there will be wonderful developments in many parts

of the arid and semi-arid area. Semi-arid Yucatan, once supposed to be fit only for scanty pasturage, exports, in prosperous years, $40,000,000 worth of sisal (123,000 tons in 1923) and there is yet room for expansion could the market be widened.

One factor of great promise in Mexico is the wide variety of agricultural products, many of which could and do find a market in the United States, such as sisal, ixtle fiber, tobacco, India rubber, coffee, and various kinds of fruit. Some of these are the products of the hot, moist lowlands and valleys, the sections of the country that have been little developed. In the exploitation of the moist tropics, the work of the twentieth century, Mexico has an opportunity to reap great benefits, provided inducements and protection are offered to temperate zone capital.

It is evident, therefore, that there are great opportunities in Mexico in agriculture; yet few of these have been exploited, and Mexico as a producer of commercial agricultural products falls below some of the other Latin–American countries.

The Pastoral Industry.—One of the reasons for the lack of development of the agricultural resources is the prominence of the pastoral industry and mining. In the United States, as we have seen, the pastoral industry has been pushed out of the natural grazing lands of the Great Plains by agriculture or a combination of agriculture and grazing, and forced to the regions of greater aridity. In parts of Yucatan a similar economic movement has occurred but, for reasons stated previously, it seems unlikely that there will be much shifting of industries in the semi-arid sections of northern Mexico. According to some sources, there are 120,000,000 acres of grazing lands.

Stock raising in Mexico dates from the Spanish conquest and received much encouragement from the Mother Country. Mexican horses and cattle were the first to appropriate the grasslands of the Great Plains in United States. Mexican horses were used by the Indians of the Great Plains, and white traders drove horses eastward from Texas to the American frontier. Through neglect, poor pasturage, and scanty water supply, much of the stock in northern Mexico is poor in quality. Even though scrawny and small, the horses and cattle are tougher and longer lived than the live stock of the more humid lowlands in the south. Diseases spread by insect pests are more common in the latter regions. Yucatan is an exception, no doubt because of the dry climate and the underground drainage.

Horses, mules, and donkeys are the transport animals in most parts of Mexico and are, therefore, in demand. The lack of good roads makes the ox-cart and the pack animal the symbols of transportation, away

from the railways. Many mines maintain contact with the railroads by pack animals.

Cheap lands and large-scale enterprise make cattle raising profitable to the *haciendadoes*, even though the home market for beef is limited and the chief exports of the industry are hides and tallow. With more careful breeding of cattle, Mexico could find a large and profitable market for beef in the United States and Europe. This, however, calls for packing plants. So far, the great packing companies of the United States have overlooked the opportunities in Mexico or have decided that conditions are more favorable to their business in Argentina and Uruguay, four to five thousand miles farther away.

Mexico as a Mining Region.—Mexico, no doubt, is one of the greatest mineral regions of the world. The dominance of igneous rocks in the plateau, as indicated previously, makes that the great metal-producing section. Coal and oil occur in the sedimentary rocks of the slopes and coastal lowlands. The history of the mining of precious metals is indissolubly associated with the post-Columbian history of the country. It was the hope of finding stores of gold and silver that led the Spanish conquistadores over mountain, plain, and desert, hundreds of miles from the center of Spanish power. Within two or three years after the conquest of Mexico City, the deposits of Zacatecas and San Luis Potosi were discovered by the Spanish. The silver vein of Guanajuata, one of the most famous silver mining districts, was discovered about 1525. The first silver mining of importance began about 1548, and for three hundred years the mines of Guanajuata furnished one-fifth, and for one hundred years about two-fifths, of the silver of the world. To-day, even after four hundred years of nearly continuous exploitation, the mines are still producing dividends. Up to date, the Guanajuata mineral region has produced upward of $1,500,000,000 worth of silver. Many of the great mining centers of to-day received their charters as cities from the Spanish Crown before the year 1550.

The stores of precious minerals helped to make many men of Spain gentlemen of leisure, adventurers, and cruel governors, disdainful of industry and trade. Some of these social ideals motivate the Spanish Creoles of Mexico to-day.

The War of Independence and the numerous revolutions that followed interfered with the mining industry, for each revolutionary leader sought to control one or more mines as a source of revenue. Many mines were, therefore, abandoned by their owners. The crude machinery used also limited the depth to which shafts could be dug. Many mines became flooded because of inefficient pumps, and cave-ins occurred. Only the most productive ores were worked, and there

has been much waste through lack of knowledge of scientific metallurgy.

Mining to-day is carried on in twenty-four of thirty-one territories. Silver is by far the most common mineral mined, but in the last few decades copper has been produced in increasing quantities.

The list of minerals includes nearly all those known to man—mercury, lead, tin, antimony, zinc, graphite, salt, and asphalt, besides gold, silver, copper, and iron ore. Coal, as we have seen, exists in Coahuila and Sonora, and in recent years Mexico has become the second greatest oil-producing country in the world. In July, 1908, one of the greatest gushers known was struck in the Tampico region, producing 60,000–75,000 barrels of oil per day. The oil flowed in such quantities that the operators could not provide steel tanks, and dirt reservoirs were thrown up. In later developments several wells were bored that produced 100,000 barrels a day, and one well alone, up to 1920, produced more than 800,000,000 barrels. In 1921 the output amounted to 193,400,000 barrels, from more than 600 producing wells.

Oil has long been known to exist, but efforts to secure it were not successful. In 1900 an American firm, through encouragement from Diaz, purchased land from the Mexican Government and began drilling. Being pioneers, American concerns were able to secure the larger part of the oil-bearing lands, and to-day, according to some reports, they control 80 per cent of the oil fields. The other holdings belong to British and Mexican firms. Oil, for a few decades at least, is likely to be the leading mineral product of the country. In the last few years, however, there has been a lull in the oil fields of Mexico because of controversies over titles and export duties. The decision of the Supreme Court of Mexico late in 1927 gives much hope to companies that secured land titles before 1917, the date of the new constitution of Mexico. The two oil regions in Mexico of greatest promise at present are the Tampico–Tuxpan and the Tehuantepec–Tabasco.

Conditions for Manufacturing.—The natural conditions for manufacturing are excellent in many parts, and Mexico is eminently capable, in so far as natural conditions are concerned, of meeting most of its own demands for manufactured goods. Labor is exceedingly cheap, though not plentiful, dependable, or skilled. In almost every city or village of the country one will find handicraft industries, such as the making of hats, weaving, pottery making, and metal working, being pursued busily. Mexico will not soon become a competitor of Europe or the United States in the world markets for the staple manufactured articles of commerce. The appeal for its goods in foreign countries arises chiefly from their bizarreness.

The raw materials are abundant and varied, and there is no lack of power resources. In the northern half of the country the low rainfall of the summer results in low water, and there are no lofty snow fields; but on the borders of the Central Plateau, as previously stated, the flow of streams is more constant and the total fall is immense. Only a few types of industries, measured by modern factories, have been started. These have grown up in the shadow of a high protective tariff or because of the high freight charges for imported goods. There are more than 150 metallurgical plants, about 140 splendidly equipped textile mills (108 operating in October, 1923), a few paper mills, some iron and steel plants, 70 brick and tile factories, 5 cement plants, 733 sugar mills (many small), and many tobacco factories and breweries, besides 65 shoe factories, 58 furniture factories, 262 woodworking plants, and others. Hardly a beginning has been made in manufacturing. Manufactured products make up a large part of the imports, and, with the exception of metals, practically no manufactured goods are exported. Mexico's proximity to the United States, now the greatest creditor nation of the world, with an abundance of capital ready to flow into foreign fields wherever safety is assured, should prove of great value in the development of manufactures in the future.

A Region of Undeveloped Resources.—More than a century ago, Humboldt, who was the first to call the attention of the world to the great resources of the country, compared Mexico to "a beggar sitting on a bag of gold." That comparison is not inept to-day, for in spite of the great resources of the soil, the forest, the pastures, and the rocks, the country is not prosperous, and though at times it has risen to a place of promise among the nations of the world, for the larger part of the last hundred years the vast bulk of the people have been hungry and in rags, and the resources undeveloped. The country has long interested and often disappointed the capitalists of North America and Europe, and at times has been a problem to the statesmen of these continents. *What are the reasons for this condition? Is there no hope for the future?*

The Low Population Density.—The low population density is one of the reasons, although far from being the most important, for the economic retardation. In only seven (not including the Federal District) out of thirty states and territories is the population density more than 50 to the square mile, and in only two is it more than 100. In twenty-two of the states and territories, the density is less than 25. In cooler latitudes a density of about 20 is associated with agriculture, widespread, although of the extensive type, such as is found in Kansas and Nebraska; but in more genial latitudes, and especially in **Always Hot** regions, such density

is associated with a much more primitive cultural development. There is room (sustenance space) for possibly 80,000,000–100,000,000 people in Mexico. Until the density is many times greater than at present, one can hardly expect the people of Mexico, even though social and political conditions were favorable, to exploit their resources intensively. Large portions, because of aridity or great heat, must long remain thinly peopled and poorly developed.

It is improbable that immigration will add much to the population of Mexico, and this, therefore, means a slow growth. Humboldt estimated that the population in 1808 was about 5,767,000 within the present boundaries of Mexico. In 1810 the population of the United States, not including Indians, was 5,862,000. What a contrast in population to-day! The United States has grown in area, it is true, but few people were added by territorial annexation or conquest. The great increase in the United States is due to natural increase and to immigration, about 35,000,000 people having entered the country from foreign lands since 1810.

Immigration has never been active in Mexico. The Spaniards prohibited immigrants from many parts of Europe for they feared they might undermine the religious faith of the country or alienate Spanish trade. The foreign population in late years has amounted to only about 115,000: about 30,000 Spaniards, 29,000 Americans, 21,000 from Guatemala, about 15,000 from eastern Asia, the remainder from France, Britain, Germany, Italy, and Cuba. Most of the foreigners are skilled engineers, merchants, and business men interested in railroads, mines, oil wells, merchant houses, and other enterprises. Mexico is no place for unskilled workers seeking a home, for the peon can underbid any European in common labor; even the West Indian Negro cannot work for the wages paid the peon. There is much unused land but it is unsuited to men or companies with little capital. Few of the immigrants become Mexican citizens. Language is somewhat of a barrier, but most of the foreigners come from countries much more desirable for permanent residence than Mexico.

The Apathy of the People.—The effect of the low density of population on the economic development is even greater than the population data would lead one to expect, because only a small part of the total Mexican population participate actively and whole-heartedly in the economic life of the country. The intelligence and education of the population is, on the average, far below that of English–America and Europe.

Mediævalism and its Effects.—The whites hold themselves superior to the other classes and attempt to keep their stock pure; but this is

impossible under the social conditions that have always prevailed in Mexico, and the mestizo, or mixed, class is increasing more rapidly than either of the others. Indeed it is predicted that Mexico in some distant time will be inhabited by a "homogeneous brown race," the mestizos. It is true that the Indian is decreasing in relative numbers because of his high mortality, the result of peonage, poverty, the unhealthfulness of some parts of the country, and unsanitary conditions; but the better class of whites in Mexico to-day will remain dominant in power. While a few of Mexico's leaders have been Indians or mestizos, the great political, military, educational, and religious leaders are and have always been white men. President Juarez was a pure-blooded Zapoteca of Oaxaca, and Diaz, a mestizo, one-eighth white. The upper class are as a rule prosperous, well educated, well informed, and affable, yet impractical. Trade and industry are not considered suitable occupations for gentlemen. The white Mexican aspires to the professions.

The more intelligent of the mestizo class follow the example set by the whites and become lawyers, physicians, and politicians, and in some cases owners of small properties and tradesmen; but by far the majority become, like the native Indians, unskilled laborers, tenders of flocks, tillers of fields, hewers of wood, drivers of pack animals, and often porters. This lower stratum in Mexican life, consisting of Indians and mestizos, is known as the peon class, a general term used to cover the people who "earn their daily bread by the sweat of their brow."

The Indian peons are the dregs of Indian tribes, once proud, powerful, progressive, that have for centuries been kept in bondage and exploited. In pre-Columbian days the Indian peon, found among the more civilized of the native tribes, was a mere slave of the rulers. Only a hovel was his home, while his king built palaces with his labor and lived in luxury. The coming of the Spaniard meant merely a change of masters. The peon, with his former taskmasters, for the Spaniard was no respecter of persons, was driven to the fields and mines and forced to toil under the lash. Gradually the peon class was augmented by the ever-increasing mestizos. The clergy often stood as protectors of the lower classes, yet they extracted money and labor to build wonderful cathedrals.

The haciendadoes, in many parts of Mexico as discussed previously, hold their laborers in peonage. By law all laborers are free, and the constitution guarantees that no man shall be obliged to render personal service without his full consent and without proper compensation; nevertheless, peonage exists. The worker gets into peonage by receiving wages in advance, and as long as his debt remains unpaid he is not

supposed to leave the hacienda without making proper financial arrangements.

To the upper classes, the lower exist to do their bidding and to be exploited. In this respect Mexico is similar to India, ancient Persia, and Egypt. The lower classes in general do not know that they are a part of the nation and care even less. Even Diaz failed to stir up a feeling of national patriotism in the breast of the peon and give him an ambition to participate in the political and economic affairs of the nation. He participates only when he can be used as a power in the hands of a politician.

In a region where it is easy to secure a living and where workers are ignorant, some sort of forced labor may be necessary; but history shows that no nation can progress in which a large part of the people are stripped of their personal liberty and kept in poverty and ignorance. From 60 to 65 per cent of the people of Mexico—some reports place the figure higher—can neither read nor write and are, therefore, handicapped in any desire, if they have one, to rise above their present position. This illiterate class is made up almost exclusively of peons. For many decades education has been compulsory, but only recently have there been attempts to provide an adequate number of schools.

In human society, be the groups large or small, there is a leavening process going on; each group or class affects, to a greater or lesser degree, the others. The upper classes in Mexico cannot help but absorb some of the lethargy, hopelessness, and inefficiency of the lower; and the lower, the contempt and indifference the higher feel toward them.

Unsettled Political Conditions.—Another reason for economic retardation is the almost constant political turmoil that has characterized the history of Mexico for the better part of a century. Since 1821 there have been about seventy-five distinct administrations. With the exceptions of the Diaz régime and the last two, the average tenure of office has been less than one year. The ease with which armies may be recruited among the peons is one of the reasons for the frequent revolutions. Being ignorant, propertyless, hungry, and lacking fealty to the nation, the lower classes are ready to join any politician that makes them fair promises. The politicians, however, who subordinate national welfare to their own personal desires, are the ones most responsible. Many of the ills to be found among the whites of Mexico to-day have their roots in the Iberian peninsula, and outcrop among most of the whites in all Hispanic American countries. These ills are extreme individualism, unfaithfulness to trusts and friends, intolerance to such an extent that they cannot see good in non-Latin civilization, and indifference to the rights of subordinates. They prate much about democ-

racy, but democracy to them is equality among the members of an oligarchy. Conditions in Mexico cannot be improved until the leaders are willing to subordinate their personal desires to the good of the country and conditions are changed to such an extent that the lower classes are brought to realize that they are a part of the nation and really can rise to places of prominence in national affairs.

The events of the last few years (since 1920), following some seven years of turmoil, give every indication that Mexico is once more in the hands of able leaders who are real patriots and who have the honest conviction that a successful democracy demands educated, land-owning citizens. Improvements in education will take several decades; but the problem is being attacked with vigor. Appropriations in recent years for education amount to 12–15 per cent of the total revenues of the national government. Rural sections are not being neglected. Education is being made a function of the government and churches are not permitted to establish or direct schools for primary education. The division of large estates is going on rapidly.

Foreign capitalists have been responsible, no doubt, for some of the political uprisings. Under Diaz, Mexico was a haven for concession grabbers, some of whom were mere speculators who sold their franchises without attempting developments. Diaz, in his enthusiasm to develop the resources, often "sold the birthright" of the Nation and received little of real benefit to Mexico in return. His shortsightedness in this matter was one of the reasons for his downfall. Before his retirement there was a strong belief that franchises should be granted only to Mexican citizens. This idea was embodied in the Constitution of 1917, which states that only Mexicans by birth or naturalization and Mexican companies are to have the right to acquire ownership in lands, water, or minerals, or obtain concessions to develop the same. Foreigners, however, may secure such rights, provided they agree not to invoke the protection of their own governments. Article 27, which declares that "in the nation is vested direct ownership of all mineral deposits," has caused great international misunderstanding in recent years. Under this article Carranza confiscated the properties of foreign oil concerns, many of whom had acquired their property in a legal way. The properties were subsequently returned, but an export tax of 25 per cent, in kind, on petroleum, was levied. Many firms closed their plants, claiming that such duties were confiscatory.

There is no doubt that Mexico has established an international principle that will serve to protect the people of the undeveloped countries of the world from political and economic encroachment on the part of capital-lending countries. Some capitalists who see in this law an end

to their venture in high exploitation in Mexico have argued that this is an evidence that Mexico is an enemy to capital. Yet one of the recent presidents of Mexico declared that foreign capital would be invited and given every justice, but the country would not grant excessive privileges at the expense of the people's rights. In this policy Mexico is within its rights. Capital Mexico must have from foreign countries, and not only capital but efficient engineers and business men along with the capital, for the country lacks money, machines, and men with technical skill and organizing ability. If Mexico can insure safety by the maintenance of peace within its own household, capital may be obtained at reasonable rates; but the turmoil of the past has kept out the safe and sane capitalist, and attracted only adventurers and speculators who invested in concessions, and these types of investors demanded high returns.

Some students of Mexican affairs have seen in the large landed estates of the upper classes, only partly tilled and partly used, in a country of a large landless population, one of the causes for the undeveloped and unsettled condition of the country. In the state of San Luis Potosi, it is claimed that 150 families owned 95 per cent of the land, yet the population of the state numbers 445,000. The far northern states have much larger estates than has San Luis Potosi. Many Mexicans believe that the division of these estates, as previously discussed, will solve many of the social, economic, and political problems of the country. Many others believe that the attempt is futile. They argue that the Indian and mestizo peons do not want land; if they did there is plenty of government land unappropriated; and besides, if farms were given them they would not keep them. Private ownership does not appeal to the peon, for he sees no need of it. All he wants is steady employment, no cares, and peace. He has no incentive to pile up wealth and have the cares of an estate. Attempts have been made in the past to solve this agrarian problem. Juarez attempted it in 1857–59; Carranza and Villa advocated it; and at various times the governors of the states have been active in dealing with it.

Under the Spanish colonial system, the Indians, or as many of them as could be induced to accept this arrangement, were settled in farm villages with gardens and fields about, and beyond these cultivated tracts were the communal lands on which the cattle grazed and from which wood was obtained. The individual families of villagers did not really own the lands; they merely occupied them. The church, for the most part (reliable estimates put the value of church property and wealth in 1857 at one-third to one-half the entire wealth of the country), and the community held possession. Juarez had the government nation-

alize the church lands and distribute the villages and communal lands among the villagers. The law also required, however, that the lands so distributed be registered before a certain date, after which they became public lands. The natives, not knowing the meaning of the law and not having the foresight to understand its import for their future, neglected to comply with it, and in a very few years rich landowners developed and the "dispossessed" villagers became homeless.

Mexico's Greatest Need.—What Mexico needs to-day in order that it may assume the rank among the nations of the world that nature destined it to hold, is an invasion of north European or English-American ideas and ideals of government, education, religion, and social and economic coöperation. The United States can assist, not by armed intervention, for that would be a calamity, but by lending a helping hand in the extension of railroad lines, the development of the rich resources, the building of factories, the improvement of roads, and the sending of educational missionaries who will teach not only the rudiments of learning but agriculture, home keeping, health and sanitation, patriotism, and the true spirit of equality. For America, with its intense desire to serve mankind the world over, Mexico is a field as fruitful as Africa or Asia and of far greater import to the future welfare of our country. Slow as the process of regeneration must be, it no doubt will be more rapid than in Africa or Asia. The United States suffers, the whole world suffers, by political turmoil in Mexico; and the world in general each year is deprived of the immense stores of mineral, forest, pastoral, agricultural, and manufactured products that might come out of Mexico were its resources developed fully. The people of Mexico are not bearing their share of the burden of supporting the population of the world.

QUESTIONS, EXERCISES, AND PROBLEMS

1. Through what physiographic provinces, temperature regions and rainfall areas would one pass in a journey from Vera Cruz to Nogales by way of Mexico City and Mazatlan? What type of vegetation and crops would one see?

2. Are there any reasons, other than climatic, why so many people live in Mexico City? How do you account for its having so large a population?

3. To what extent has climate affected the distribution of people in Mexico?

4. Make a statistical comparison of Mexico and Canada in area, population, area of cultivated land, forest area, agricultural and mineral production, commerce, miles of railroad, illiteracy, percentage of people in school, postal business, miles of navigable rivers, miles of railroads, miles of telegraph lines. Most of these data may be obtained from the Statesman's Year Book. How do you explain the difference in material development?

5. Make a study of the underlying facts of recent diplomatic controversy between the United States and Mexico. Is the United States in the right or is Mexico? Be

careful to read both sides of the question. The magazines issued in 1926 and 1927 contain many articles on this subject. In a republic, even the humblest citizen should acquaint himself with the policies and acts of his government. The Mexican question is rooted in economic, commercial, and political geography, as are most great international problems to-day.

6. To what extent is it true that most of the industries of Mexico are owned and operated by foreigners? How do you account for this condition?

CHAPTER XXX

MIDDLE AMERICA

THE highlands of Central America and the islands of the West Indies, which really are submerged mountains, form an orographical system quite distinct from that of North America or South America, the isthmus of Tehuantepec being the northern boundary, and the Atrato River the southern. Central America and the West Indies, from a geologic standpoint, therefore, may be called Middle America. These two divisions of Middle America have many things in common. Besides being similar in geologic origin and location, their shores are washed by the same sea. They both lie in the path of the *Northeast Trades*. They have similar temperature conditions, similar indigenous plant life, and similar crops, and a large part of the main line of their histories is similar.

CENTRAL AMERICA

The Central American Union.—In Spanish Colonial days the Central American states, exclusive of Panama, formed one province, Guatemala, under a captain-general who had his seat of government at Guatemala City. Even Chiapas, now a state of Mexico, which is topographically, geologically, and climatically a part of Central America, was attached to Guatemala. The feeling of brotherhood that existed among the Latin American nations during and following the Wars of Independence no doubt was the reason for Guatemala's uniting, in 1871, with Mexico, with Iturbide as emperor. But topographic conditions do not favor large political units anywhere in the highlands of tropical Latin America. To escape the discomforts of the hot, moist climate of the coastal lowlands, the white rulers in Colonial days selected highlands for their homes, where the climate is more like that of Spain. There, centers of population grew up. These centers being separated from each other by scores or hundreds of miles, each became a seat of government. The size of the political unit formed depended for the most part on the distance between the centers. In 1823 Guatemala declared itself separate from Mexico (Chiapas remained) and the next year was reorganized as the Republic of Central America. But the tendency

toward separation asserted itself again, and one by one the natural political units separated from the Central American nation and there came to be five small independent countries.

In recent decades there have been attempts to revive the Union, but until the population nuclei that have grown up about each capital are all closely united by railroads there is little possibility of the formation of a strong federation. In 1907 the five Central American states agreed to organize and abide by the decisions of a Court of Arbitration which is housed in a building given by Andrew Carnegie at Cartago, Costa Rica. This has been of some value in bringing the countries toegther. In 1921 a new union was established, but only three states, Guatemala, Honduras, and Salvador, accepted membership. However, in a conference held in Washington in the fall and winter of 1923–24, five republics concluded with each other a total of eleven agreements, three protocols, and a general treaty of peace. Chief among the agreements was one limiting armaments; it was agreed also to refer all differences between countries to a peace tribunal. Presidents or vice-presidents may hold office but one term. No nation will interfere with the affairs of another in case of civil war, nor permit the organization of revolutionary bands within its border against a sister republic. All but Costa Rica agreed to establish free trade between the signatory countries.

Surface Features and Rocks.—The main topographic features of the countries of Central America are similar. There is a mountain and plateau highland extending longitudinally near the center. This highland area lies nearer the Pacific side of the area, and hence the steeper slope is on the west side. The eastern slope forms wide plains in Guatemala, Honduras, and Nicaragua. The larger rivers flow into the Caribbean, a few being navigable for small boats a considerable distance from the sea. Most of the rivers, however, are partially closed at their mouths by sand bars. Lake Nicaragua lies between two mountain ranges, and although near the Pacific it drains eastward through the San Juan River into the Caribbean.

Central America has a great variety of geologic formations. There are very ancient rocks like those of the Piedmont Plateau, and Old Land of Canada, which contain a great variety of metallic minerals, including gold, silver, copper, lead, and tin. These deposits have been little exploited because of lack of capital and dense vegetation which prevents exploration. There are coal beds in rock of the same age as the coal-bearing rocks of the United States.

Vulcanism has been active in many parts of the highland area, in fact, some of the highest peaks are of volcanic origin, and the plateau in some parts owes its height to lava deposits. The region is young

geologically, earthquakes are frequent, and violent volcanic eruptions are common. The rich soil of many parts of the highland is volcanic in origin, derived from volcanic cinders and ash which have buried large areas several feet deep at times. In other parts the high temperature and abundant moisture and decaying vegetation rapidly disintegrate the rocks and make them into deep rich soil. Although there is some surface wash from heavy rains and probably rapid leaching, the soil-making processes are rapid and there is little depleted land.

Climate and its Effect on Population Distribution.—Central America lies within the tropics. The lowlands are, therefore, in the **Always Hot** belt of temperature, *Tierra Caliente.* In the highland section the temperatures are mild and pleasant, making the plateau a delightful region in which to live. The *Northeast Trades* bring great quantities of moisture from the Atlantic and the Caribbean Sea. On the eastern lowlands it is jokingly said that it rains thirteen months in the year; yet there is here a wet season, the heaviest rain coming during the summer when the equatorial belt of rains shifts northward over all of Central America and much of Mexico. The western slopes and highland have their wet season from May to September. There is an over-abundance of rain on the eastern lowlands, while on the western slopes there is need of irrigation in some parts. At some points on the eastern lowlands the rainfall is 195 inches per year, while on much of the highlands it is only 27 inches. The hot, moist climate of the eastern lowlands makes that region unsuited to white population.

Most of the people of Central America, nearly all the important cities, and most of the railroads, roads, and cultivated lands are on the highlands. In some of the countries, 75 per cent or more of the people are on the plateau.

Climate and Plants.—It is not difficult to find a correlation between vegetation density and amount of rainfall. The vegetation is more luxuriant and varied on the lowlands, yet still abundant in the higher and drier portions. There is a wide range of natural plant life and of cultivated crops.

On the eastern lowlands the forests contain mahogany, ebony, rosewood, and cedar, which are cut and shipped to the United States. In some parts a "chocolate" tree grows wild. There are also medicinal plants furnishing vegetable oils, besides rubber-producing trees. More than half a hundred varieties of banana trees are indigenous to the region. The drier parts of Central America are covered with savannas (tropical grasslands with scattered trees), excellent regions for the grazing of cattle and horses, and lands suitable for the cultivation of some crops. Some parts of Guatemala are too dry for cultivation

except through irrigation. Pines and oaks are found in the higher parts of the uplands.

Temperature is a factor in the vertical distribution of economic plants in Central America. Up to 1500 feet the products are chiefly tropical. At a few places on the lowlands the forests have been removed, and great banana, rubber, cacao, and sugar plantations have been made, where native Indians and West Indian natives work under the supervision of white men from the United States or from the highlands of Central America. For the most part, the chief occupation of the people on the lowlands, other than the work on the plantations, is timber cutting and the collecting of wild forest products that have commercial value. This region is producing only a small part of what it is capable of, because so few people live here. Coffee plantations are common in most of the republics between 2000 and 4500 feet above the sea. (Fig. 288.) Here also may be grown sugar cane and cotton. Some of these countries, particularly Costa Rica, produce a very excellent coffee which is sent mostly to European markets. In Guatemala, coffee plantations are chiefly in the hands of German settlers. Crops like those of the central United States are grown on the highlands above 5000 feet—wheat, corn, and beans, potatoes, and other vegetables. Corn and beans have a wide range of distribution.

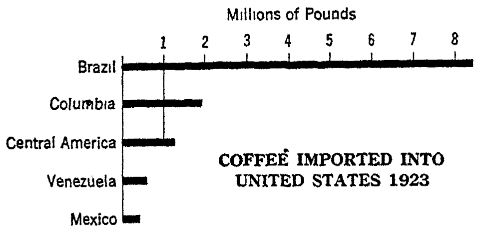


FIG. 288.

Economic Opportunities.—Many travelers have spoken in high terms of the great opportunities offered in Central America for man to make a living and prosper. The climate and soil offer optimum conditions for plant growth. Bennett reports, " There is little soil erosion even on slopes that would be hopeless in our latitude." As many as four crops per year may be grown. The wide variety of mineral deposits has been commented on. The admirable position of the whole region, between the Atlantic and the Pacific, with good harbors and long coastlines, should give it abundant opportunities to get its products to the markets of the world. The people in some of the countries have lived up to the opportunities nature offers and have made much progress.

Progress and Anarchy in Central American Countries.—Costa Rica and Salvador have made much advance in transportation, commerce, agriculture, and education. Costa Rica is undoubtedly the most prosperous of the Central American republics. It has had peace within its

borders since 1842. The Costa Ricans dislike wasting their resources in wars or on war material, preferring the arts of peace, and they welcome those bringing wealth from other countries. Foreign capital has been invested to help develop the resources. On the eastern coast, the United Fruit Company has large holdings of land. The forests have been removed from large areas, swamps drained, railroads built, and the land planted with banana trees. Limon is the chief port, and from this center 7,000,000–9,000,000 bunches, 300–400 shiploads, of bananas are exported each year. (Figs. 289, 290, 291, and 292.) The United Fruit Company has brought prosperity to this

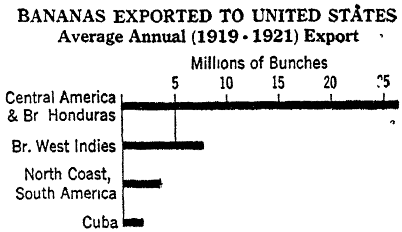


FIG. 289.

Courtesy of United Fruit Co.

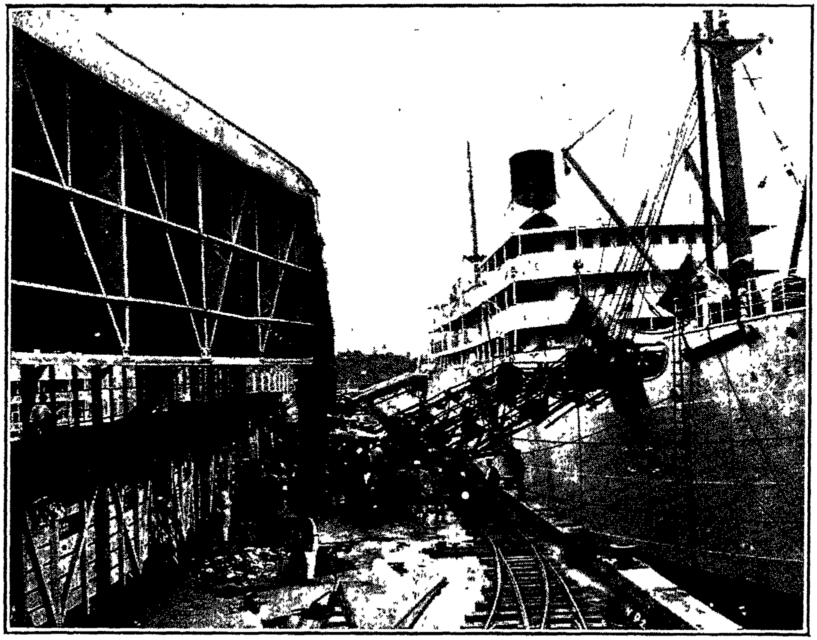
FIG. 290.—Bananas at a Railway for Shipment.

Bananas are cut when still green. If allowed to ripen on the tree they lose much of their flavor, burst open, and become infested with insects. The bananas are "packed" by man or animals to the railroad. Here they are inspected, only the green bunches are taken. A nine-hand bunch (nine clutches each with ten to twenty "fingers") weighs from fifty to seventy-five pounds.

hitherto undeveloped section. The company has built a railway from Limon to San José. Much of the economic life of the plateau is based on coffee culture, and coffee growing has tended to keep the

country free from revolutions. The planters early found that their orchards, on which their prosperity depended and which required years to develop, could be destroyed within a few hours.

Costa Rica is a real democracy. There is freedom of the press and religion. The land for the most part is in small plots which, in general, are worked by the owners. There is no tax on land, a condition that encourages land ownership. The country has an excellent educational



Courtesy of United Fruit Co.

FIG. 291.—Loading Bananas for Shipment to United States.

The time of arrival of these ships at the banana export port is communicated by radio and every attempt is made to have the banana trains ready to supply a cargo to the ship on its arrival. The bananas are carefully selected at the dock. The hold of the ship is cooled by refrigeration, care being taken to keep a uniform temperature of about 57 degrees. The usual cargo is about 75,000 bunches.

system with real compulsory education, real schools, and good teachers. The mineral deposits are being worked actively, and the exports amount to about four times those of any other Central American country.

The high quality of the people is the chief reason for the fine progress that Costa Rica has made. Fully 60 per cent of the total population is white, and 80 per cent of the people of the *meseta* or central plateau are white. This part of Central America was settled by poor Spanish families, and, since the Indian population was small, slave labor or peon-

age has never been a factor in the economic life of the country. There are only 3500 pure blooded aborigines in the country at present. The people, from the first, acquired habits of industry which to-day find their reward in the advancement the country has made. The name Costa Rica, it is said, was a joke in Colonial days because the country was held by poor Spaniards who were forced to work for a living.

Courtesy United Fruit Co.

Fig. 292.—Unloading Bananas at an American Port.

The fruit is handled with care to avoid crushing. The bunches are carefully inspected at the unloading ports by experienced men. The ripest are sold locally, the green bunches are sent to more distant distributing points in refrigerator cars. In winter the cars must be heated. The cars are carefully inspected en route either by traveling caretakers or inspectors stationed at regular stopping points.

At the other extreme of economic and political development stands Honduras, with a public debt of much over $135,000,000 on which no interest has been paid since 1872. There has been little development in the country except along the coast where foreign companies have banana and sugar plantations. The laborers on these coast lands are mostly West Indian Negroes. Concessions have also been granted for the exploitation of the forest and mineral resources, but little work has been done because of constant political disturbances. There are a few schools outside the towns. Roads are few, and the half dozen short

railroads are all on the coastal lowlands and do not reach the section where most of the people are. The population density is only 12.5 to the square mile, and the population is largely made up of aboriginal Indians. About 20 per cent of the Indians are uncivilized. Similar in political and economic conditions to Honduras are Guatemala and Nicaragua.

Railroads and Ports.—Transportation facilities, essential adjuncts to all economic development, are greatly lacking. Railroads are very few, and what lines there are are short. Railroad building is difficult because of the rough topography and the heavy forests in the tropical portions; and when once built the railroads are subject to frequent and disastrous washouts from the heavy tropical rains. Some single rains cause more than a million dollars' damage on a single line and incapacitate the road for several months. The railroads probably are not paying ventures, because the population density is low, the flow of commerce is light, and there is no great system of routes that tends to bring about an exchange of commodities over a large area. Railroad building has been generally neglected in Central America, chiefly from lack of capital and the prevalence of graft, but also because the dictators have opposed it. "The dictator has seen in steel rails a drawbridge over the moat into his baronial castle." The area is really too small to develop any extensive system. Most of the roads in each country center at the capitals and extend to one of the important sea ports. In Guatemala, Costa Rica, and Panama there are railroad connections between the east and west coasts. Not a single line crosses the frontier between two countries at the time of writing. Port facilities are surprisingly good on the east coast. There are five natural harbors: Trujillo and Puerto Barrios in Guatemala; Puerto Cortez in Honduras; Puerto Limon in Costa Rica; and Bocas del Toro in Panama. These have been improved, but mostly by foreign companies. The handling of cargoes on the west coast is done with few exceptions by lighters. At some points the water is so shallow that even the lighters do not touch the shores, the longshoremen being obliged to wade to and from the lighter.

Until recently, the most highly developed part of Central America was shut off from any contact with Europe and the United States by being located on the Pacific Slope, which necessitated a long land haul to get to the coast of the Caribbean or a long sea voyage around the Horn. The Panama Canal, however, has put the densely settled sections in easy contact with the Atlantic traffic lines and will aid greatly in their future growth and development. Unfortunately, the portions of these countries that produce the agricultural and forest products that temperate

zone people are calling for, such as sugar, rubber, and bananas, have been shunned by the white man in the past and have been little developed. The highlands produce commodities which are comparable in many respects to those of temperate lands, and for which there is no great call in the markets of Europe and America. However, improved sanitation has reduced many of the " horrors " of the moist tropics, and the white man sees in these lands great possibilities. Some of the most prosperous and most peaceful sections of these countries to-day are on the east coast where the great development companies have cleared off the forests; drained the land; built towns, wharves, railroads, hospitals, churches, and schools; given work to thousands; and maintained peace. The regeneration of these countries may yet come from the hitherto neglected wet tropical coast lands.

THE PANAMA CANAL AND CANAL ZONE

The Spanish–American War, in 1898, showed the people of the United States the great need of a canal across the Isthmus of Panama. They realized then, as never before, that a water route through the Isthmus of Panama would enable them to protect their coasts with a much smaller navy, for vessels could be shifted readily from either coast to the other. Our growing foreign commerce and rapid industrial development also called for a shorter water route to the Pacific.

Just after the settlement of the Oregon Question and the acquisition of California, the United States, seeing the need of bringing the Pacific Coast into closer touch with the eastern part of the country, made a treaty with Colombia, in 1846, obtaining the right to a transit route for a road, railroad, or canal across the Isthmus. But the urge was not sufficient to lead to action, and the right was allowed to lapse. In 1898, new treaties, this time with Panama, had to be made, for a lease on the Canal Zone and a right of way for a canal in this zone. In the meantime the French had attempted to excavate a canal but had failed through lack of funds and inability to cope with tropical diseases. By 1904 medical science had discovered many ways of controlling tropical fevers, a scientific development of great importance to the United States in the Canal Zone.

Construction on the American Panama Canal was begun in 1904, and the first boat passed from ocean to ocean on August 15, 1914. The great task of linking the Atlantic with the Pacific was completed in a little more than ten years and three months, at a total cost of about $375,000,000.

The Americans met and solved the same problems that had con-

fronted the French. The floods of the Chagres River are regulated by a huge dam at Gatun, 7500 feet long, and 2100 feet wide at its greatest width, with a spillway about 1.5 miles long, over which the flood waters flow after they have reached sufficient height. A large lake, Gatun Lake, is formed above the dam. Into this lake the water of the undrowned portions of the Chagres River flows, and across this lake, by means of embankments, the Panama Railroad is carried. The canal, for nearly a third of the distance across the Isthmus, passes through this lake, excavations being necessary at some places, to give sufficient depth. Some of the water of the Chagres River is used for the operation of the canal. Gatun Lake, therefore, takes care of the excess water and at the same time furnishes water for the locks and eliminates the trouble arising from the crossing of the river channel and the canal.

The mountain ridge that forms the backbone of the isthmus is passed by a huge cut, called the Culebra Cut, nearly 500 feet deep and 7 miles long. The amount of excavation necessary to pass the mountain range was materially reduced by the use of locks; three double locks at Gatun, by which the largest ocean vessels are locked up from the Atlantic Ocean level to the level of Gatun Lake, 85 feet above the sea; and, on the Pacific side of the Isthmus, one double lock at Pedro Miguel, and two double ones at Miraflores, by means of which vessels passing to the Pacific are lowered 85 feet to the Pacific level. The minimum depth of the canal is 41 feet; the width of the lock chambers is 110 feet, and the length 1000, thus accommodating the largest of ocean vessels.

On September 23, 1915, after the canal had been in operation a little more than a year, slides occurred on the sides of the Culebra Cut after a great rain, and great masses of earth were pushed up from the bottom of the canal, nearly closing the channel. An examination showed that the angle of the slope of the cut was too steep for the earth to remain at rest under all conditions, and that the soft nature of the material in the hill and its great weight had resulted in the earth in the bottom of the cut being forced upward. Dredges were soon at work removing the obstructions. The canal remained closed to traffic until April of the following year. Since that time the slopes of the cut have been greatly reduced, and the hill lowered. Earthquakes are common in the Central American region, and it was thought by some that perhaps earth movements might interfere with the operation and success of the canal; but records show that earthquakes are very infrequent in this part of Central America, and it is believed that no trouble will ever be experienced from this source.

The third great problem that had to be solved was the most important of all and the one that really caused the failure of the French, as

previously stated, this was the control of diseases. Forests were cut, undergrowth was removed, swamps were drained, a good source of domestic water was provided, buildings were thoroughly screened, and the garbage and sewage were properly disposed of. These measures made the Canal Zone cities and camps as sanitary and as healthful as most American cities. It was even boasted that the death rate in Colon and Panama was lower than that in any American city; but these low figures were due to the fact that many of the sick persons were removed from the Zone before death occurred.

There are many benefits that accrue to the United States by the building of the Panama Canal. The journey across the isthmus by ship takes, if no delays are met with, from seven to eight hours, the record time being four hours and ten minutes. Without the canal, ships would have to sail southward the whole length of South America around the "Horn," or through the dangerous Strait of Magellan, and north along the west coast. Between New Orleans and San Francisco the Panama Canal saves vessels 8870 miles, or about twenty-eight days of time. To Valparaiso from New Orleans, the saving is 4750 miles. San Francisco is nearer New York by 7870 miles; Yokohama, Japan, nearer by 3700 miles; and Hawaii, by 5280 miles. By the canal, Japan is 1800 miles nearer New York than Liverpool; Shanghai is nearer New York by 1600 miles; and Sydney, Australia, by 2400 miles. These shorter distances tend to reduce the importance of British entrepôts and greatly aid in the establishment of direct lines of steamers between New York and the Orient. Formerly, the west coast of South America was about as near to London as it was to New York by steamer. Now it can be reached from New York by sailing almost directly south

New Orleans is more than 2600 miles nearer Callao than is Liverpool. The west coast of South America, like the Caribbean Lands, is, distance considered, definitely within the commercial sphere of the United States. Vessels are now able to sail around the continent of South America and are not forced to retrace their route, as they formerly did. The western coast of the United States has cheaper freight rates than before, on goods to or from the eastern states. Many of the Rocky Mountain States are commercially tributary to our western coast, while before the completion of the canal there was a tendency to look toward the East for most of their commercial dealings. The Gulf Coast of the United States has been benefited. Railroad lines extending north and south have increased their traffic greatly, and the Gulf ports handle much of the traffic between Latin America and the Middle West that formerly went to New York. A saving of time means lower freight rates and cheaper products to the consumer.

In the year ending June 30, 1925, more than 5000 ships passed through the canal, the total cargo tonnage being more than 23,000,000 tons, and the tolls collected $21,400,000. The net income for that year was nearly $13,500,000. (Fig. 293.)

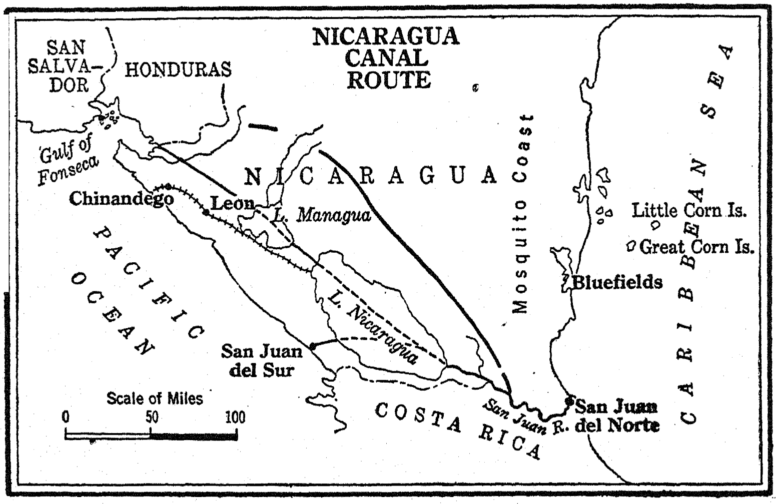


FIG. 293.

In 1916 the United States secured the right to construct a canal across Nicaragua (the exact location has not been settled on), the two Corn Islands in the Caribbean, and a naval base on the Gulf of Fonseca for $3,000,000. The canal route was secured "in perpetuity" but the islands and site for naval station are leased for 99 years. The route shown on the map is the most feasible. Another possible route is from San Juan del Sur eastward to the lake.

WEST INDIES

To the east of Central America and Yucatan and between North and South America is a great watery expanse, 1600 miles east and west, and 1200 miles north and south, strewn with islands varying in size from the area of a village lot to that of the average American state. These islands number thousands, some barren, some in their native condition covered with forests, some unsettled, some with well-tilled farms, plantations, and cities. Cuba, the largest of the West Indian Islands, and one of the Greater Antilles, has an area of 44,000 square miles, about that of Tennessee. The second in area is the island of Haiti, which has 28,000 square miles, nearly that of South Carolina.

The Islands Classified as to Origin.—The West Indian Islands are commonly divided into the Greater Antilles and the Lesser Antilles, the Anegada Passage to the east of the Virgin Islands forming the dividing line. The Bahama Islands, though somewhat isolated from the West

Indies and forming a large group of some 700 islands and islets and more than 2000 rocks, may well be classed with that island world.

The physical features and bed rock vary greatly in the different islands of the West Indies. The Greater Antilles are continental in structure, character of rocks, and surface features. The Lesser Antilles are typical oceanic islands. The Bahamas are mostly low islands of calcareous materials.

Cuba has mountains in both the eastern and western portions; but those to the west are low, and at least 85 per cent of the area offers no hindrance to cultivation. Most of the other islands have hilly or mountainous interiors, with fertile valleys, and are bordered by coastal plains. Haiti has many lofty mountains, between which there are broad and immensely rich valleys. The highest mountains of the West Indies are found here. The interior of Porto Rico is rough, but it can hardly be classed as mountainous for the slopes can be cultivated nearly to the tops of the hills.

Many of the islands of the Lesser Antilles are simply the tops of great mountain masses whose bases rest on the sea bottom several thousand feet below the surface of the ocean. One writer expresses this tersely by saying that in the Lesser Antilles one goes to the top of the mountain in a boat. In most of the islands, however, the mountain peaks stand far above the sea level.

In the West Indian section great earth movements have occurred in recent geologic periods. The whole of the region has been depressed, some portions more than others, those deeply depressed forming basins. Just to the north of Porto Rico is a depressed ocean basin about 25,000 feet deep. The Bahamas are low hillocks on a broad submarine plain, similar in surface features to Florida, and may well be considered as an extension of the Florida peninsula.

The islands of the inner row of the Lesser Antilles are largely of volcanic material, or are remnants of huge heaps of old volcanic material carved by running water and waves. The outer row of the Lesser Antilles is truly coraline, coral forming massive layers of limestone that mantle the surface and form a fringe about the coast. It is very possible that the core of many of these coraline islands is of igneous rock. Coral forming is active about the shores of most of the islands of the West Indies.

Climatic Conditions and Effects.—The climate is similar in all the islands of the West Indian region. The lowlands are in the **Always Hot** temperature region; the mountains are much cooler. In the highlands of the interior of Cuba the thermometer occasionally falls to freezing point, and thin ice will form in December and January when the

winds are in the north. The whole region lies in the *Trades* with steady winds from the northeast in the Greater Antilles, and from the eastward and southeastward in the Lesser Antilles. Because there is so much water and so little land, the climate is oceanic in every respect. The range of temperature is slight, and the air has a high relative humidity. In the larger islands rain is heavy on the windward side of the mountain slopes. The plain and low islands on the windward side of the islands have little rain. On the leeward side there is little rain, and irrigation is necessary for profitable agriculture on most of the islands. In Jamaica the annual rain in different parts varies from about 25 inches to nearly 200, and in Porto Rico from 20 to 100 inches. Salt from sea water is made along the lagoons by natural evaporation, on the north shore of Cuba, because here the rain is slight and the *Trades* are

Courtesy United Fruit Co.

FIG. 294.—A Herd of Beef Cattle on an American Plantation in Cuba.

The United Fruit Company is engaged in various types of farming and scatters its activities in many lands in the Caribbean. Crop failure or disaster in a few sections has little effect on the annual returns of the company.

drying winds. On the south slope of Cuba, the slight rainfall permits only a thin growth of trees, and it is here that the Spaniards early settled to work the placer deposits of gold and silver. This difference in distribution of rain also influences the distribution of crops. Sugar and bananas are the most important of the products raised on the hot, moist lowlands. In some islands, rubber, cacao, and rice are produced. Coffee is confined to well-drained hill and mountain slopes in the less humid sections, and some of the finest tobacco in the world comes from the southward facing valleys of western Cuba where the rainfall is much less than on the northern slope. Cattle are raised in some of the isolated sections of the Greater Antilles, where the forests have been removed or where savannas are the natural vegetation. (Fig. 294.) The Lesser Antilles in general have plenty of rainfall, heavy rains falling

almost every day. Occasionally there are cloudbursts that cause considerable damage. The most unfavorable features of the climate are the hurricanes, or tropical cyclones, which are common and very destructive.

The climate of the West Indies is remarkably healthful in spite of the fact that it is tropical. The *Trades* are the saving feature. On some of the islands, English and French people have lived for generations with little or no apparent ill effects. Alexander Hamilton, Dumas, and the Empress Josephine were all born in the West Indies on colonial plantations. Some English family names have figured in the history of the West Indies for centuries. Sufficient time has not yet elapsed, however, to determine the fitness or unfitness of the islands for the white race. It is true that the Negro has multiplied with the luxuriance of topical vegetation and now far outnumbers the whites on many of the islands and has entirely displaced them on others; but the relative decrease in the number of whites is undoubtedly due, to some degree, to economic factors. The decline of the sugar industry has resulted in the emigration of many whites. Some writers believe that the quality of the whites has declined; but perhaps superior people are not attracted as they were when fortunes were to be made easily. Whatever the cause, white leaders are becoming fewer; the death rate is still high for whites, and even for the colored people.

The Mingling of Races and Nations.—Probably in no other region of similar area on the earth would one find such a variety of history as in the West Indies. Some tiny islands have histories more voluminous than many an American commonwealth. Because of their position in the *Trade-wind* belt, nearly opposite the Canary Islands, the point from which many of the early explorers departed, the West Indian Islands were the first to be visited by Columbus. By 1514 most of the West Indian Islands had been visited and taken possession of by the Spaniards. Other explorers from Europe came—Dutch, French, and English—and preyed on the Spanish settlements and on the commerce between Spain and the West Indies (a term which for a time included all the Spanish possessions in America). All the nations laid claim to lands in the great island world, sent colonists, and began to exploit the agricultural resources. As the climate was not found favorable for work for the white man, and the Indians had been enslaved and nearly exterminated by the Spaniards before the coming of other Europeans, Negroes from tropical Africa were imported. The first were brought by the Spaniards in 1502, and in the early part of the nineteenth century the British colonists alone imported 20,000 slaves annually. The islands of the West Indies soon became the most valued possessions of the European nations. They are easily reached by sailing vessels

following routes set by the North Atlantic winds and ocean currents. Their climate is salubrious, and their natural beauty makes them veritable fairylands. They became the chief source of the world's sugar supply. England, for a hundred years before beet sugar was developed in Europe, fought the Netherlands, Spain, and France for the West Indian sugar lands. In the sixteenth, seventeenth, and eighteenth centuries, the financial prosperity of western Europe was greatly increased by commerce with the West Indies, and the products of these islands were worth more "than all the gold and silver of the American continent." Muscavado, that cost $100 per ton to produce with slave labor, sold for $300 per ton, and many a small West India plantation produced for its owner each year in sugar alone $50,000–$100,000.

The West Indies being such valuable possessions naturally became pawns in the great game of empire building. Individual islands being small and at the same time possessing value, both because of their productivity and strategic position, repeatedly changed their political affiliations. In any of the many European wars, a victory for England meant that many of the more important islands became British; and, England being dominant on the sea, the choicest islands, particularly the more strategic, fell to her lot. Some of the less important islands have been in the hands of one nation for centuries; others have frequently changed their flag. One finds French-speaking populations on the islands now owned by Britain, and Spanish-speaking populations on islands under American control or protection. In Haiti the people in the western part speak French, and those in the eastern part, Spanish.

Location and the various economic opportunities offered have made the West Indies a region where races have commingled throughout all historic times. As these islands form a chain from the coast of South America to the tip of Florida and almost to Yucatan, it was easy for even primitive men, Caribs and Arawacks, to make a thousand-mile journey by sea in frail canoes on trips of conquest or commerce. The Caribs were canoe people. Columbus wrote of them that "they run through all the islands of India and plunder and take as much as they can." Civilized man in more seaworthy carrying agents has come from much longer distances. The Indian was supplanted by people from Europe and Africa, North America, and South America. In recent decades thousands of Asiatic coolies have been brought to some of the islands to labor on the plantations, so that in these islands one finds representatives of five of the continents.

To add to the complexity of ethnic relations, there has been much intermarriage of races. Negroes have mixed with Indians, whites with Negroes and Indians, and Asiatics with Negroes and Indians. The pure

whites of one nationality have mixed with those of another. The frequent raids by pirates and buccaneers in the early Colonial periods added much to the complexity of the language, races, and moral standards.

The population of Cuba is predominantly white, consisting of descendants of Spanish colonists, with several hundred thousand foreigners from many countries, for it offers excellent opportunities for people interested in trade, commerce, lumbering, or mining. More than 60 per cent of the people of Porto Rico are white, the remainder being largely Negro. Haiti and Santo Domingo are known as the Negro and the mulatto republics, respectively. In the Lesser Antilles the Negro element dominates.

Isolation of Islands and Parts of Islands.—Seemingly at variance with the evidence of ethnic mixing is the fact that there is a general lack of inter-communication in the West Indies, a condition hardly to be expected when one considers the short sea distance that separates them. This condition is as true between the various parts of the larger islands as between the various islands. The lack of communication is probably the result of the hilly or mountainous topography of the interior of the islands, the primitive condition of many of the people, the general lack of ambition, the poorness of the roads, the density of the forests, the differences in speech, customs, and ideals, and the lack of development of maritime interests by the islanders themselves. As for maritime activity in Colonial days, the whites were too busy with the affairs of their plantations to go to sea; there was no large middle class of whites dispossessed of lands; and the lower classes were held in bondage. Most of the carrying trade in Colonial days was in the hands of seamen from New England and European countries. Most of the European colonizing nations had navigation laws prohibiting commerce between their colonies and those of another, or between their colonies and the people of another nation. This checked intercolonial trade. The vessels in Colonial days were so small that rarely was it necessary to visit several islands to discharge a cargo lot or secure a shipload. Similarity in products in the islands did not, and does not now, call for intertrade. Now, however, steamer lines make the circuit of many ports, and the water passages are used by many steamer lines.

The result of this lack of communication has been the development of distinct types of civilization, each of which " assumes the individuality and political importance of an independent empire." Nearby islands present great contrasts in customs, speech, institutions, and opportunities. Herne noted the lack of unity even between parts of the same island. He says, regarding Martinique, "People are born and buried in the same valley without even seeing towns a few hours' journey beyond

their native hills, and distinct racial types are formed within three leagues of each other."

Population Density.—Still another characteristic of the islands is their dense population. Cuba and Haiti are comparatively thinly populated, but most of the other islands are more densely peopled than the mainland of America. The average density of the mulatto republic of Santo Domingo (the Dominican Republic) is about 46 (estimated), and for Cuba about 73, both of which are comparable to the average of the Southern States of the United States and much above those of the Central American republics. Jamaica has an average of about 204; Porto Rico, 378; and Barbados, nearly 1200. The average for the Virgin Islands, the new possessions of the United States, is nearly 200. In Barbados the population density has about reached its saturation point, but in most of the other islands there is yet much room for growth. So easy is life, so few are the demands nature makes on man, so abundantly does nature supply materials to meet these demands, and so low are the standards of living of the vast majority of the people, the islands are capable of supporting a population many times as dense as the rural parts of the United States.

Porto Rico.—Porto Rico, over which the American flag has waved since 1898, is, in the words of one writer, " one of the loveliest of all those regions of loveliness which are washed by the Caribbean Sea." It is a tropical island, wet on the slopes up which the *Trade Winds* blow, and so dry on the level lands and lee slopes that irrigation is necessary to get good returns from the land. Ocean winds, which are drying on most parts of the island, give low sensible temperatures and reduce the daily and annual maximum that would naturally occur on a land at this altitude. The monthly means rarely vary more than 6 degrees during the year, and the extreme range is only about 40 degrees. The high interior is cooler than the coasts. With the exception of the tropical hurricanes that may come between July and October, the island is a delightful home for its million and more inhabitants. The Spaniards who made the first settlement in 1509 found the moister parts of the island heavily wooded, many of the trees being of commercial value. Besides mahogany, cedar, ebony, logwood, and sandalwood, there are 28 medicinal plants, 8 plants that furnish resins, 12 that furnish condiments, and an equal number from which dyes and tannin may be obtained. During the three hundred years that Porto Rico was a penal colony for Spain, the forests remained almost intact. But about 1815, when colonists were allowed to take up land and with their slaves made preparations for sugar plantations, the forests were destroyed in the moist plains on the north side of

the island. The exploitation and destruction of the forests have gone on apace, until little of the original stand is left.

In geologic structure the island is simple. There is a base of igneous rock that outcrops in the higher parts, and, resting on this on both north and south, are inclined beds of limestone that dip toward the sea. In harmony with the simplicity of the geology, there are few minerals, practically all coming from the igneous rocks. Gold was easily found in the stream beds by the Spaniards, but in small quantities; cinnabar occurs in some parts; and there are small deposits of iron ores. The building stones are few in variety.

During the long period that the island was under Spanish control, there was peace and prosperity but little progress. The better class of Spanish creoles were satisfied with the rule of the Spanish Crown, and in the history of Porto Rico there are few uprisings against the Mother Country. Possibly the futility of such disorder deterred the leaders, as the small size of the island reduced the chances for a successful revolution. The peasant class of creoles were peaceable, indolent, unschooled, yet intelligent. They lived a quiet, simple life on their small patches of land. Their tools were primitive, and their methods were simple. The Negro first came as a slave, and after his emancipation remained to form a lower stratum of society. About 38 per cent of the population of the island is colored, consisting for the most part of mulattos. The great dominance of white blood among the people is probably the chief reason for the rapid progress that has been made since the American occupation.

With American control came American capital to be invested in sugar lands, coffee, tobacco, and banana plantations. Porto Rican products now entered American markets free of duty, and there was ushered in an era of prosperity. About 8 per cent of the people are engaged in the industries, which include the preparation of sugar, coffee, and tobacco for market and the making of soap, matches, furniture, vehicles, and machinery.

America's greatest work has been done in the building of roads and railroads, in the improvement of sanitary conditions, and in the introduction of a practical modern educational system. Still, about 50 per cent of the people are illiterate. The percentage, when United States took over the islands in 1899, was about 80 per cent. There are now 1100 miles of roads and 340 miles of railroads. A railroad now encircles the island. There are common schools, high schools, manual training schools, agricultural schools, and a university.

Although there has been some agitation in recent years on the part

though Spain would be forced to relinquish its hold at the bidding of Britain, strongly urged the United States to take steps to acquire possession of the island because of its strategic position. The position of Cuba makes it imperative that its control should never go to a nation that could use it as a base of operations against the United States; and this might happen as long as the island remained in the hands of a weak power like Spain. The widespread sympathy felt in America for the Cubans in their attempts to free themselves of Spanish misrule, and the fact that Americans had much capital invested in sugar lands, whose earning power was greatly reduced because of the unsettled conditions, were the chief causes that led us to make war against Spain in 1898. At the close of the war we assumed the rôle of protector and advisor of the Cubans whenever it was evident to us that peace was endangered. For a time our army held control in Cuba, but turned over the government to the Cubans upon the establishment of a responsible government. Three times since—in 1906, 1912, and 1917—we have been forced to intervene to check revolts or threatened revolts against the established government.

American capital has for decades been going into Cuba in increasing amounts. Estimates give approximately $1,500,000,000 as the total of American investments in Cuba. About $375,000,000 of this is in sugar lands, centrals, and railroads and harbor works for the handling of sugar. Americans own some 85 sugar centrals and 4,500,000 acres of sugar land. The United States takes about 85 per cent of the exports of Cuba and sells to Cuba about 65 per cent of its imports. Our physicians and sanitary experts in the past have performed inestimable services in Cuba in stamping out yellow fever and other tropical diseases. The 200,000 tourists that visit Cuba each year are largely from the United States, and their expenditures contribute much to the income of some Cubans. Another link that binds Cuba and America is the leasing of Guantanamo Bay for a naval and coaling station, for which we pay $2,000,000 as annual rental.

The Quality of the People.—The prosperity of the island, the high regard the great powers have for Cuba, and the general freedom from internal political disorders are due largely to the high quality of the Cubans in general, about 70 per cent of whom are white, to able leadership, and to the fact that peace and order are guaranteed by the United States. It is comparatively easy for Cubans to secure loans in foreign countries, and capital seeks opportunities for investments in land, sugar mills, railroads, and public works. Trade is in a healthy condition. In 1924 the imports amounted to $290,500,000 and the exports to $434,000,000—large sums for a population and an area (44,000 square miles)

about equal to those of an average American state east of the Mississippi River. One cannot, however, fail to give credit to American money and enterprise in explaining the rapid development of Cuba in recent decades.

Agriculture the Basal Activity.—Agriculture is the basal industry of the island, the surface features, soil, and climate being about as favorable as in any section of the world. Except for the prominent Sierra Maestra Range, some peaks reaching 3000–4000 feet, and one about 8000, in the far eastern end of the island, the Pinar del Rio in the west, and a few low groups of hills here and there in the intervening area, the land is largely a rolling plain. Even the hills and mountains have many fertile valleys.

The basal rock of the island is old crystalline, metamorphic, and igneous rock which outcrops over a large area in the Sierra Maestra Range and here and there in other parts of the island where erosion has removed the sedimentary rock which apparently once covered almost the entire island. It is this old crystalline rock that contains the bulk of the minerals of Cuba, such as iron ore (most of which goes to the United States) copper, manganese, and chromium. The dominant rock, however, is limestone, and it is from the limestone that most of the soils are derived, both the residual and the alluvial.

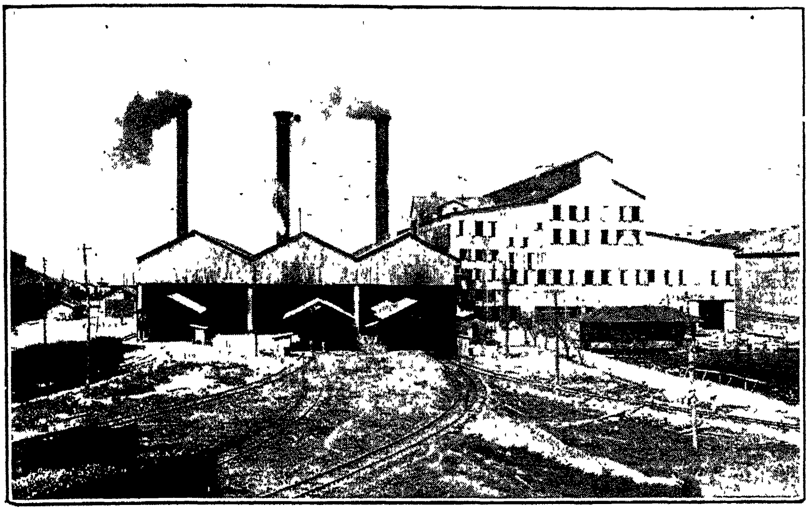
Lying on the equator-ward side of the 68° isotherm for the coldest month, Cuba has a tropical climate. Frosts are unknown except on the uplands. The monthly averages for Cienfuegas, which is fairly central and on the south shore, range between 76° for February, the coldest month, and 88° for September, the warmest. Temperatures below 50° and above 90° are rare. On the north coast the effect of a high summer sun is mitigated by the cool winds from the northeast. The rainfall is plentiful. The wet season, during which about two-thirds of the rainfall occurs, is from April to November. The northern slopes of the island receive more rainfall than the southern, but the offshore islands on the north coast are semi-arid, a condition that favors the evaporation of salt as an industry.

Hurricanes, which visit the island once or twice a decade, and severe droughts, which are not uncommon, are the discouraging features in agriculture. The United States furnishes an excellent market for the major crops of the island. The preferential tariff on sugar is highly favorable to the Cuban sugar growers. (Figs. 295 and 296.)

Transportation Facilities.—Transportation facilities, both within the island and on the seas, are fairly adequate. There are more than 3000 miles of railroad, not including the 2800 miles of private lines on the 200 large sugar estates.

It is reported that automobilists have 1500 miles of good roads, and

the national congress has recently adopted a plan for the expenditure of more than $300,000,000 on a vast system of roads. The long coastline and excellent harbors give abundant overseas contact. Recently



Courtesy United Fruit Co.

FIG. 295.—A Central of the United Fruit Company in Cuba.

Centrals are at the center of vast area of cane. Raw sugar is the chief marketable product of the central.

the central government has limited overseas traffic to a few ports, an edict that will work great hardships on the large sugar companies, many of whom had provided their own wharves near their "centrals."

The Forests.—Large areas of Cuba are still in forest, containing cabinet and dye woods. Some of these forests are state-owned, but many

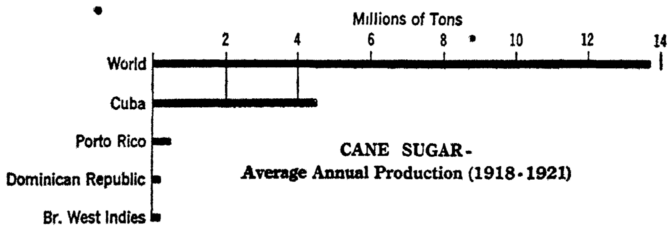


FIG. 296.

sugar companies have large areas on their estates, portions of which are cleared from time to time to supply virgin lands.

Manufactures.—Manufacturing is mainly the preparation of agricultural products for foreign markets. Raw sugar, tobacco, cigars,

leather, hats, clothing, and alcoholic drinks are among the more important products.

QUESTIONS, EXERCISES, AND PROBLEMS

1. What European nations possess colonies in Middle America? List the colonies belonging to each. Of what commercial value are they to these countries? Get the data on exports and imports and types of articles entering into commerce? To what extent do these colonies trade with the United States?

2. Rank the different political divisions of Middle America in area, population, illiteracy, miles of railroads, imports, exports, and any other data furnished by the Statesman's Year Book. Has material progress been greater in independent countries or in the colonies? What is one of the reasons for the high rank Cuba holds among the independent countries? Rank the countries of central America. Which one stands first in your opinion? Which one the lowest? How do you explain the differences? Is it environment or man?

3. Why is Cuba called the "Island of a Hundred Harbors?" What physical conditions give it so many harbors? Is this of any particular advantage? Would ten serve the needs of commerce as well as a hundred?

4. What are the benefits of American rule in Porto Rico? Read the *National Geographic Magazine*, Vol. XLVI, December, 1924.

5. What prompted the United States to construct the Panama Canal? In what way have we benefited by its construction?

6. With what countries does Cuba have commercial relations? Does proximity to the United States have any bearing on the trade relations of Cuba? What other factors may affect the extent of our commerce with Cuba?

SELECTED LIST OF REFERENCE MATERIAL

A given publication is listed only once, though it may contain material on several of the divisions shown. The list is intended as an aid in building a reference library.

General

1. United States Government Publications. (Lists should be obtained from at least the following departments.)
   (1) Department of Foreign and Domestic Commerce.
   (2) Department of Agriculture.
   (3) Department of the Interior.
   (4) War Department.
   (5) Navy Department.
   (6) Government Printing Office. (Copies of catalogs of government publications.)
2. R. H. Whitbeck and V. C. Finch: Economic Geography. McGraw-Hill Book Co., N. Y., 1924.
3. O. E. Baker: Agricultural Regions of North America. Economic Geography. Vol. 2 (1926), p. 459; Vol. 3 (1927), pp. 49, 309, 447; Vol. 4 (1928), p. 44.
4. C. C. Colby: Source Book for the Economic Geography of North America. University of Chicago Press, Chicago, 1922.
5. E. Huntington and F. E. Williams: Business Geography. John Wiley & Sons, N. Y., 1926.
6. J. R. Smith: North America. Harcourt, Brace & Co., N. Y., 1925.
7. R. Zon and W. N. Sparhawk: Forest Resources of the World. McGraw-Hill Book Co., N. Y., 1923.
8. World Atlas of Commercial Geology. U. S. G. S., Washington, 1921.
9. V. C. Finch and O. E. Baker: Geography of the World's Agriculture. Government Printing Office, Washington, 1917.
10. W. G. Kendrew: The Climates of the Continents. Oxford University Press, American Branch, N. Y., 1922.
11. R. Jones and P. W. Bryan: North America. Lincoln MacVeagh, The Dial Press, N. Y., 1924.
12. J. R. Smith: The World's Food Resources. Henry Holt & Co., N. Y., 1919.
13. Isaiah Bowman: The New World. World Book Co., Yonkers-on-Hudson, N. Y., 1921.
14. Chambers of Commerce Atlas. George Philip & Son, Ltd., London, 1925. (Also published by G. P. Putnam & Sons, N. Y.)
15. Goode's School Atlas. Rand McNally & Co., Chicago, 1923.
16. Raymond Pearl and Ford Kelly: Forecasting the Growth of Nations. Harper's Monthly, Vol. 142 (1921), p. 704.

United States

1. Agriculture Yearbooks. 1921 to 1925, inclusive. U. S. D. A., Washington. (These volumes are invaluable.) An annual.
2. Commerce Yearbook. U. S. Dept. of Commerce, Washington.
3. N. M. Fenneman: Physiographic Boundaries Within the United States. Annals of Association of American Geographers, Vol. 4 (1914), p. 19.
4. Helen M. Strong: The Geography of the Northern Interior. Jour. of Geog., Vol. 23, p. 121.
5. Fourteenth Census of United States. Government Printing Office, Washington.
6. Eric Englund: The Dilemma of the Corn Belt. World's Work, Nov., 1926, p. 40.
7. R. DeC. Ward: The Climates of the United States. Ginn & Co., N. Y., 1925.
8. G. J. Miller: Some Geographic Influences of the Lake Superior Iron Ores. Bul. Am. Geog. Soc., Vol. 46 (1914), p. 881.
9. R. H. Whitbeck and others: Selected Cities of the United States. Jour. of Geog., Vol. 21 (1922), p. 205.
10. J. Paul Goode: The Geographic Background of Chicago. University of Chicago Press, Chicago, 1926.
11. J. R. Whitaker: The Relation of Agriculture to Mining in the Upper Peninsula of Michigan. Jour. of Geog., Vol. 25, p. 21.
12. R. H. Whitbeck: Economic Aspects of the Glaciation of Wisconsin. Annals of Association of American Geographers, Vol. 3 (1913), p. 62.
13. R. H. Whitbeck: The Influence of Lake Michigan upon Its Opposite Shores with Comments on the Declining Use of the Lake as a Waterway. Annals of Association of American Geographers, Vol. 10 (1920), p. 41.
14. C. O. Sauer: The Geography of the Ozark Highland of Missouri. University of Chicago Press, Chicago.
15. A. E. Parkins: Historical Geography of Detroit. Michigan Historical Commission, Lansing, 1918.
16. R. Hartshorne: The Significance of Lake Transportation to the Grain Traffic of Chicago. Econ. Geog., Vol. 2 (1926), p. 274.
17. G. T. Trewartha: The Green County, Wisconsin, Foreign Cheese Industry. Econ. Geog., Vol. 2 (1926), p. 292.
18. E. Van Cleef: The Finn in America. Geog. Rev., Vol. 6 (1918), p.185.
19. O. E. Baker and others: Atlas of American Agriculture. U. S. D. A., Washington.
20. Charles R. Van Hise: Conservation of Natural Resources. Macmillan Co., N. Y., 1910.
21. O. D. von Engeln: Effects of Continental Glaciation on Agriculture. Am. Geog. Soc., Vol. 46 (1914), pp. 241, 336.
22. Florence Whitbeck: The Proposed Great Lakes–St. Lawrence Deep Waterway. Jour. of Geog., Vol. 21 (1922), p. 57.
23. C. F. Marbut: Soils of the Great Plains. H. L. Shantz: Natural Vegetation of Great Plains. J. B. Kincer: The Climate of the Great Plains as a Factor in Their Utilization. O. E. Baker: Agriculture of the Great Plains. Annals of Association American Geographers, Vol. 13 (1923), pp. 41, 51, 67, 109.
24. Ellen C. Semple: American History and Its Geographic Conditions. Houghton, Mifflin & Co., N. Y., 1904.
25. M. Keir: Manufacturing Industries in America. The Ronald Press Co., N. Y., 1920.

26. Transportation on the Great Lakes by U. S. Army Engineers and U. S. Shipping Board. Government Printing Office, Washington, 1926.
27. Port Series by U. S. Army Engineers and U. S. Shipping Board. Government Printing Office, Washington. (There are now 20 sets available in this series. They constitute a superior treatment of the United States ports.)
28. ISAAC F. MARCASSON: The Black Golconda: The Romance of Petroleum. Harper & Bros., N. Y., 1924.
29. Senate Doc. 183, 69th Congress, 2d Sess. Message from the President of the United States Transmitting a Report of the Chairman of the United States St. Lawrence Commission upon the Development of Shipping from the Great Lakes to the Sea. Government Printing Office, Washington, 1927.
30. E. S. GRIGG, A. L. CRICHER, AND OTHERS: Great Lakes-to-Ocean Waterways. U. S. Dept. of Com., Dom. Com. Ser. No. 4, Washington, 1927.
31. Cyclopedia of American Agriculture, Vols. I, II, III, IV. Macmillan Co., N. Y., 1912.
32. A. J. HENRY AND OTHERS: Weather and Agriculture. Agriculture Yearbook, 1924, p. 457.
33. E. W. SHEETS AND OTHERS: Our Beef Supply. Agriculture Yearbook, 1921, p. 227.
34. W. H. HAAS: The Cliff Dweller and His Habitat. Annals of Association of American Geographers, Vol. 16 (1926), p. 167.
35 O. C. STENE AND OTHERS: Cotton: Atlas of American Agriculture. U. S. D. A., Washington, 1918.
36. WM. E. DODD: The Cotton Kingdom: A Chronicle of the Old South. Yale Univ. Press, New Haven, Conn.
37. A. M. AGELASTO AND OTHERS: The Cotton Situation. Agriculture Yearbook, 1921, p. 323.
38. C. E. LEIGHTY AND OTHERS: The Corn Crop. Agriculture Yearbook, 1921, p. 161.
39. C. W. LARSON AND OTHERS: The Dairv Industry. Agriculture Yearbook, 1922, p. 281.
40. KATHERINE COMAN: Economic Beginnings of the Far West, Vols. I and II. Macmillan Co., N. Y., 1912.
41. RAYMOND MCFARLAND: History of New England Fisheries. D. Appleton & Co., N. Y., 1911.
42. T. H. MATTHEWS: Fisheries of the North Atlantic. Econ. Geog., Vol. 3 (1927), p. 1.
43. C. V. PIPER: Our Forage Resources. Agriculture Yearbook, 1923.
44. A. P. BRIGHAM: United States of America: Studies in Physical, Regional, Industrial and Human Geography. Oxford University Press, N. Y., 1927.
45. J. W. SMITH: Rainfall of the Great Plains in Relation to Cultivation. Annals of Association of American Geographers, Vol. 10 (1920), p. 69.
46. Guide Books to Western States. Bulletins Nos. 611. 612, 613, 614, and 707, U. S. G. S., Washington.
47. C. V. PIPER AND OTHERS: Hay. Agriculture Yearbook, 1924, p. 285.
48. E. Z. RUSSELL AND OTHERS: Hog Production and Marketing. Agriculture Yearbook, 1922, p. 181.
49. SAMUEL FORTEIR: With the Irrigation Farmer. Agriculture Yearbook, 1920, p. 203.
50. A. P. DAVIS: Irrigation. John Wiley & Sons, N. Y., 1917.
51. R. P. TEELE: Irrigation in United States. D. Appleton & Co., N. Y., 1915.

52. C. H. DAVIS: Urban Development in the Kentucky Mountains. Annals of Association of American Geographers, Vol. 15 (1925), p. 92.
53. L. C. GRAY AND OTHERS: The Utilization of Our Lands for Crops, Pasture, and Forests. Agriculture Yearbook, 1923, p. 415.
54. O. E. BAKER: Land Utilization in the United States: Geographical Aspects of the Problem. Geog. Rev., Vol. 13 (1923), p, 1.
55. M. KEIR: Some Responses to Environment in Massachusetts. Bul. of Geog. Soc. of Phila., July and Oct., 1917.
56. Mineral Resources of United States: U. S. G. S., Washington.
57. GEORGE ROORBACH: Geographic Influences in the Development of the Manufacturing Industry of the Mohawk Valley. Jour. Geog., Vol. 10 (1911), p. 80.
58. PHILIP EMERSON: The New England States. Macmillan Co., N. Y., 1901.
59. CLIFTON JOHNSON: New England. Macmillan Co., N. Y., 1917.
60. S. A. BEACH AND OTHERS: The Apples of New York. New York State Exp. Sta., Geneva, 1905.
61. U. P. HEDRICK AND OTHERS: The Grapes of New York. New York State Exp., Sta., Geneva, 1908.
62. R. H. WHITBECK: Geographic Influences in the Development of New York State. Jour. Geog., Vol. 9 (1912), p. 119.
63. W. L. G. JOERG: The Subdivision of North America into Natural Regions. Annals of Association of American Geographers, Vol. 4 (1914), p. 55.
64. H. J. COX: Weather Conditions and Thermal Belts in the North Carolina Mountain Region and Their Relations to Fruit Growing. Annals of Association of American Geographers, Vol. 10 (1915), p. 57.
65. Oil Shales: Bul. No. 641, U. S. G. S., Washington.
66. A. E. PARKINS: Development of Transportation in Pennsylvania. Bul. Geog. Soc. of Phila., Vol. 14 (1916), pp. 92, 148; Vol. 15 (1917), p. 1.
67. H. T. LEWIS and S. I. WELLER: Economic Resources of the Pacific Northwest. Lowman & Hanford, Seattle. 1923.
68. V. R. GARFIAS: Petroleum Resources of the World. John Wiley & Sons, N. Y., 1923.
69. N. M. FENNEMAN AND OTHERS: Physiographic Divisions of the United States. Annals of Association of American Geographers, Vol. 6 (1916), p. 19.
70. ISAIAH BOWMAN: Forest Physiography. John Wiley & Sons, N. Y., 1911.
71. M. A. JULL: The Poultry Industry. Agriculture Yearbook, 1924, p. 377.
72. C. G. GILBERT and G. E. POGUE: America's Power Resources. Century Company, N. Y., 1921.
73. A. E. PARKINS: A Comparison of Trans-Appalachian Railroads. Jour. of Geog., Vol. 9 (1912), p. 113.
74. D. A. SPENCER: The Sheep Industry. Agriculture Yearbook, 1923, p. 229.
75. F. S. EARLE: Southern Agriculture. Macmillan Co., N. Y., 1908.
76. CLIFTON JOHNSON: Highways and Byways of the South. Macmillan Co., N. Y., 1904.
77. F. P. GARVIS: The Southern Plantation. Columbia Univ. Press, N. Y., 1924.
78. Blue Book of Southern Progress. Manufacturer's Record, Baltimore, 1924.
79. HUGH BENNETT: The Soils and Agriculture of the Southern States. Macmillan Co., N. Y., 1921.
80. Soil Reports (Annual), Bur. of Soils, U. S. D. A.
81. Soils of United States. Bul. No. 95, Bur. of Soils, U. S. D. A.
82. E. W. BRANDES AND OTHERS: Sugar. Agriculture Yearbook, 1923, p. 151.

83. ROBERT DEC. WARD: Composite Temperature Types of the United States. Geog. Rev., Vol. 12 (1922), p. 116
84. HARRIET SMITH and DARTHULA WALKER: Geography of Texas. Ginn & Co., Chicago, 1923.
85. WM. B. GREELEY AND OTHERS: Timber: Mine or Crop? Agriculture Yearbook, 1922, p. 88.
86. W. W. GARVER AND OTHERS: History and Status of Tobacco Culture. Agriculture Yearbook, 1922, p. 395.
87. F. H. NEWELL: Water Resources. Yale Press, New Haven, Conn., 1920.
88. G. W. JAMES: Reclaiming the Arid West. Dodd, Mead & Co., N. Y., 1917.
89. C. R. BALL AND OTHERS: Wheat Production and Marketing. Agriculture Yearbook, 1921, p. 77.
90. WM. B. GREELEY: Wood for the Nation. Agriculture Yearbook, 1920, p. 147.
91. Statistical Abstract of the United States. (An annual.) U. S. Dept. of Com.

ALASKA

1. A. H. BROOKS: The Value of Alaska. Geog. Rev., Vol. 15 (1925), p. 25.
2. L. A. WOLFHANGER: Economic Regions of Alaska. Econ. Geog., Vol. 2 (1926), p. 508.
3. A. W. GREELEY: Handbook of Alaska. Scribner, N. Y., 1919.
4. F. G. CARPENTER: Alaska: Our Northern Wonderland. Doubleday, Page & Co., Garden City, N. Y., 1923.
5. A. H. BROOKS AND OTHERS: Mineral Resources of Alaska. Bul. 773 (and others), U. S. G. S., Washington.
6. C. G. SMITH: Regional Development of Pulpwood Resources of the Tongass National Forest. Bul. 950, U. S. D. A., Washington, 1921.
7. Alaska: Our Frontier Wonderland. Chamber of Commerce, Seattle, Wash.
8. C. C. GEORGESON: Information for Prospective Settlers in Alaska. U. S. D. A., Washington, 1917.
9. General Information Regarding the Territory of Alaska. Office of the Secretary, Dept. of Interior, Washington, 1923.
10. Report of the Alaska Agricultural Experiment Stations. U. S. D. A., Washington.
11. S. HADWIN and L. J. PALMER: Reindeer in Alaska. Bul. No. 1089, U. S. D. A., Washington, 1922.
12. W. T. TOWER: Alaska Fishery and Fur Seal Industries in 1920. U. S. Bureau of Fisheries, Washington, 1921.
13. Report of the Governor of Alaska (Annual). Dept. of Interior, Washington.
14. M. B. SUMMERS: Some Features of the Climate of Alaska. Monthly Weather Review, Oct., 1924, p. 493. U. S. D. A., Washington.
15. Alaska Section. Summary of the Climatological Data for the United States, by Sections. U. S. Weather Bureau, Washington.
16. Price List of Government Publications on Alaska. Superintendent of Documents, Washington.
17. A. H. BROOKS: The Future of Alaska. Annals of Association of American Geographers, Vol. 15 (1925), p. 163.

Canada

1. Publications of Natural Resources Intelligence Service, Ottawa. (The following are a few of the many valuable publications.)
   (1) The Peace River District, 1922.
   (2) Natural Resources of the Prairie Provinces, 1925.
   (3) Manitoba: Its Development and Opportunities, 1925.
   (4) Natural Resources of Nova Scotia, 1925.
   (5) Central British Columbia, 1922.
   (6) Saskatchewan: Its Development and Opportunities, 1923.
   (7) Natural Resources of Quebec, 1924.
   (8) New Brunswick: Its Development and Opportunities. (No date.)
   (9) Canada: Natural Resources and Commerce, 1923.
   (10) The Lower Athabaska and Slave River District.
   (11) Canada as a National Property, 1926.
   (12) The Gaspé Peninsula: Its Natural Resources and Development, 1926.
   (13) Prince Edward Island, 1927.
2. Report on the Grain Trade of Canada. Dominion Bureau of Statistics, Ottawa, 1923.
3. G. A. Young: Geology and Economic Minerals of Canada. Dept. of Mines, Ottawa, 1926.
4. Reindeer and Musk-ox Industries. Report of the Royal Commission, Dept. of Interior, Ottawa, 1922.
5. Canada Yearbook. Dominion Bureau of Statistics, Ottawa. (This Bureau issues many other valuable publications, among which are (1) Census Reports, (2) Annual Report of the Trade of Canada, (3) Monthly Bulletin Agricultural Statistics, (4) Fisheries Statistics, (5) Mineral Production, etc. Obtain a complete list of publications.)
6. T. D. Hammatt: Marketing Canadian Wheat. Supplement to Commerce Reports. Trade Information Bul. No. 251, U. S. Dept. of Com., 1924.
7. Report on the Fur Farms of Canada, 1924. Dominion Bureau of Statistics, Ottawa, Canada.
8. Series of Guide Books to Canada. Geological Survey, Ottawa, 1913.
9. D. B. Dowling: Coal Fields and Coal Resources of Canada. Memoir 59, Geological Survey, Ottawa, 1915.
10. Publications of the Meteorological Service of Canada, Ottawa.
11. Clarence Jones: The Grain Trade of Montreal. Econ. Geog., Vol. 1 (1925), p. 58.
12. Marketing Canadian Wheat. Trade Information Bul. No. 251, U. S. Dept. of Com., Washington.
13. R. D. Craig: Forest Resources of Canada. Econ. Geog., Vol. 2 (1926), p. 394.
14. M. J. Patton: The Coal Resources of Canada. Econ. Geog., Vol. 1 (1925), p. 73; and the Water Power Resources of Canada, Vol. 2 (1926), p. 168.
15. V. Stefansson: The Friendly Arctic. Macmillan Co., N. Y., 1922.
16. V. Stefansson: The Northward Course of Empire. Harcourt, Brace & Co., N. Y., 1922.
17. C. C. Colby: The Annapolis-Cornwallis Valley. Econ. Geog., Vol. 1 (1925), pp. 173, 337.
18. W. A. MacIntosh: The Laurentian Plateau in Canadian Economic Development. Econ. Geog., Vol. 2 (1926), p. 537.

19. Water Power in Canada. The Engineering Journal (Canadian), Vol. 7, No. 7, July, 1924.
20. Oxford Survey of the British Empire. Vol. 4. Oxford Clarendon Press, London, 1914.
21. V. STEFANSSON: My Life with the Eskimo. Macmillan Co., N. Y., 1927.
22. V. STEFANSSON: Some Erroneous Ideas of Arctic Geography. Geog. Rev., Vol. 12 (1922), p. 264.

NEWFOUNDLAND

1. L. W. MEEKINS: Newfoundland: Commerical and Industrial Survey, Trade Information Bul. No. 409, U. S. Dept. of Com., Washington, 1926.
2. DON SEITZ: The Great Island. Century Co., N. Y., 1925.
3. Yearbook and Almanac of Newfoundland. The Royal Gazette, St. John's, Newfoundland.
4. P. T. MCGRATH: Newfoundland in 1911. Whitehead, Morris & Co., London.
5. H. M. MOSDELL: 5000 Facts about Newfoundland. St. John's.
6. Numerous maps and pamphlets have been issued by various departments of the government, e.g., of Marine and Fisheries, Agriculture and Mines, Finance and Customs, Posts and Telegraphs, Education, Public Works, Shipping.

MEXICO AND MIDDLE AMERICA

1. ROBERT PLATT: Central American Railways and the Pan American Route. Annals of Association of American Geographers, Vol. 16 (1926), p. 12.
2. GEORGE MCBRIDE: The Land System of Mexico. Am. Geog. Soc., N. Y., 1923.
3. E. M. SANDERS: The Natural Regions of Mexico. Geog. Rev., Vol. 11 (1921), p. 212.
4. FRANK G. CARPENTER: Mexico. Doubleday, Page & Co., N. Y., 1924.
5. Mexico. A Handbook of Geography. Section of the Naval Intelligence Division, London, 1920.
6. SUMNER CUSHING: The Distribution of Population in Mexico. Geog. Rev., Vol. 11 (1921), p. 227.
7. ELLSWORTH HUNTINGTON: The Relation of Wealth to Racial Capacity: The Example of Mexico. Geog. Rev., Vol. 11 (1921), p. 243.
8. Census of Cuba, 1919. Maza. Arroy y Caso, Havana, 1920.
9. R. H. WHITBECK: Geographical Relations in the Development of Cuban Agriculture. Geog. Rev., Vol. 12 (1922), p. 223.
10. HUGH BENNETT: Agriculture in Central America. Annals of Association of American Geographers, Vol. 16 (1926), p. 63.
11. R. T. HILL: Cuba, Porto Rico, and Other Islands of the West Indies, 1898.
12. CHESTER LLOYD JONES: Mexico and Its Reconstruction. D. Appleton & Co., N. Y., 1922.
13. WALLACE THOMPSON: The People of Mexico. Harpers, N. Y., 1920.
14. G. H. BLAKESLEE: Mexico and the Caribbean. G. E. Stechert & Co., N. Y., 1920.
15. CARLETON BEALS: Interpretation of Mexico. B. W. Huebsch, N. Y., 1923.
16. E. O. ROSS: The Social Revolution in Mexico. Century Co., N. Y., 1923.
17. ARTHUR BULLARD: The Canal, the Industry, and the People of Panama. Macmillan Co., N. Y., 1914.

18. FREDERICK O. OBER: Guide to West Indies. Dodd, Mead & Co., N. Y., 1908.
19. STEPHEN BONSAL: American Mediterranean. Dodd, Mead & Co., N. Y., 1913.

ORGANIZATION AND TESTING

1. M. E. and F. K. BRANOM: The Teaching of Geography. Ginn & Co., N. Y., 1921. (Contains extensive bibliography.)
2. M. E. BRANOM: The Measurement of Achievement in Geography. Macmillan Co., N. Y., 1925.
3. R. H. WHITBECK: Fact and Fiction in Geography by Natural Regions. Jour. of Geog., Vol. 22 (1923), p. 86.
4. P. R. STEVENSON: Recent Development in Geography Testing. Jour. of Geog., Vol. 22 (1923), p. 121.
5. M. C. STARK: Teaching Value of Geographic Regions. Jour. of Geog., Vol. 22 (1923) p. 81.
6. D. C. RIDGLEY: Geographic Principles. Houghton, Mifflin Co., N. Y., 1925. Also, Geographic Principles in the Study of Cities. Jour. of Geog., Vol. 24 (1925), p. 66.
7. EDITH PARKER: Evaluating Tests in Geography. Jour. of Geog., Vol. 21 (1922), p. 121.
8. H. M. STRONG: The Significance of Geographic Regions. Jour. of Geog., Vol. 21 (1922), p. 348.
9. B. C. ENGLE: A Geographic Unit as Illustrated by the Paris Basin. Jour. of Geog., Vol. 21 (1922), p. 353.
10. M. E. BRANOM: The Objective Measurement of Problem Geography. Jour. of Geog., Vol. 25 (1926), p. 52.
11. C. A. MCMURRY: Type Studies in the Geography of the United States. Macmillan Co., N. Y., 1920.
12. W. L. G. JOERG: Subdivision of North America into Natural Regions. A Preliminary Inquiry. Annals of the Association of American Geographers, Vol. 4 (1914), p. 55.
13. M. C. STARK and D. S. WHITTLESEY: Major Geographic Regions of North America. McKnight & McKnight, Normal, Ill., 1923.
14. F. K. BRANOM: A Bibliography of Recent Literature on the Teaching of Geography. Clark University, Worcester, Mass., 1925.
15. W. H. KILPATRICK: The Project Method. Teachers College Record, Vol. 19 (1918), p. 319.
16. S. C. PARKER: Problem-Solving, or, Practice in Thinking. Elementary School Journal, Vol. 21 (1920), p. 98.
17. H. H BARROWS: Geography as Human Ecology. Annals of Association of American Geographers, Vol. 13 (1923), p. 1.
18. G. J. MILLER: Essentials of Modern Geography and Criteria for Their Determination. Jour. of Geog., Vol. 13 (1914), p. 129.
19. N. M. FENNEMAN: The Circumference of Geography. Annals of Association of American Geographers, Vol. 10 (1919), p. 3.

MAGAZINES

1. Journal of Geography. A. J. Nystrom & Co., 2249 Calumet Ave., Chicago, Ill. (Official publication of the National Council of Geography Teachers.)
2. Economic Geography. Clark University, Worcester, Mass.

3. Geographical Review. American Geographical Society, New York City.
4. Annals of the Association of American Geographers. Address A. E. Parkins, George Peabody College for Teachers, Nashville, Tenn.
5. Bulletin Geographical Society of Philadelphia, Philadelphia.
6. Commercial America. Philadelphia Commercial Museum, Philadelphia.
7. Commerce Reports. U. S. Dept. of Com., Washington.
8. Bulletin Pan-American Union, Washington.
9. National Geographic Magazine, Washington.
10. World's Work. Doubleday, Page & Co., Garden City, N. Y.
11. Foreign Affairs. Council on Foreign Relations, 25 W. 43d St., N. Y.
12. Travel. Robert M. McBride & Co., 7 W. 16th St., N. Y.
13. Mentor. The Mentor Association, Springfield, Ohio.
14. World Agriculture. World Agriculture Corporation, 137–9 E. 25th St., New York.

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